Cold-extruding steel shell — see page 2

Lapping—a special report

GUARDED 3 ways!

Heald guarding saves time – saves effort – saves maintenance

Each machine shipped from the Heald factory is *triply guarded* – for safety, convenience, and maximum efficiency of operation.

Proper machine guarding is more than just a matter of meeting safety requirements – or J.I.C. standards. It means guarding against *extra costs*, too! And the guards and covers for every Heald machine are especially designed with this in mind.

You don't have to install special guards for your own particular tooling set-up. That's all taken care of for you. You can let the chips fall where they may, without danger of fouling the table ways or piling up under bridges. Coolant is carefully controlled, too – with guards designed to prevent spattering on the floor or operator. And dust and dirt – perennial enemies of precision equipment – can't harm the working parts or electrical controls.

In short, Heald's extra precautions in guarding add up to extra savings for you – in reduced maintenance, easier operation, and sustained production efficiency.

Remember – when it comes to precision finishing, it pays to come to Heald.

THE HEALD MACHINE COMPANY

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TRAMRAIL CRANES

Indispensable for Efficient Production

Even though most parts could be moved by hand in this electrical factory, production is speeded and safety improved by employing inexpensive cranes with electric hoists

Plenty of cranes in this Diesel motor plant ease the work and boost production.

Three things which are held extremely important to modern industrial plants are achieved by the use of simple Cleveland Tramrail overhead cranes:

(1) Production is speeded
(2) Costs are cut
(3) Safety is improved

Cranes save many costly man-hours of skilled mechanics by enabling one man, in most cases, to pick up and move heavy or awkward parts that ordinarily require hard and dangerous work by several men when lifting and tugging by hand.

Even where light loads are lifted only a few times a week, it has come to be realized that the cost of Cleveland Tramrail cranes is well justified because they are a tremendous factor in the elimination of hernias, smashed hands and feet, wrenched backs and other unnecessary injuries.

Progressive plants regard overhead materials handling equipment as indispensable.

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THE CLEVELAND CRANE & ENGINEERING CO.
1404 East 284th Street, Wickliffe, Ohio.

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Buried Treasure

in Your Product?

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Dig deeply into this million-dollar question: "How could *my* product increase its usefulness and sales . . . *by counting?*" And you may well uncover a new and distinctive merchandising appeal that will set your product apart from competition . . . as so many manufacturers have done.

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American Machinist

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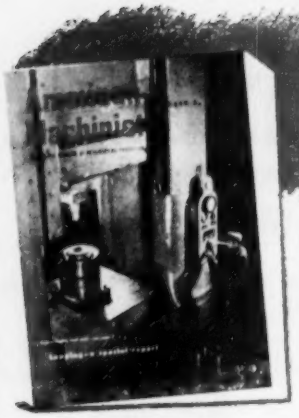


Chips and Quips

For Cold Extrusion . . . That big press you may have heard about for cold extrusion of steel (*AM*, Apr. 3, '50, p174) makes its first public appearance as our cover Kodachrome. Built for Mullins Manufacturing Co. by Lake Erie Engineering Corp., this 3000-ton hydraulic press features the high working area required to clear the work from the die in downward extrusion. In addition to the long stroke this requires, the press features an unusual range of speeds and pressures. Already Mullins is producing 105-mm projectiles by cold extrusion, and these will be turned out on the new press. But with the experiments the flexibility of this press makes possible, the Ordnance Department hopes to learn more about the process, perhaps extend it to larger work.

Press Feeding . . . Getting small parts in or out of a press at high speeds calls for ingenuity. We've provided two examples . . . J. D. Thompson and G. W. Rada of Western Electric tell how a chain feed carries leaf springs through a forming die—at rates up to 2500 per hour . . . J. A. Goodbar, dieroom foreman for Westinghouse at the Lima Works describes stacking chutes that protect laminations as they drop from the press.

Rigidity . . . You wouldn't normally picture the parts of a machine tool as a chain, but you may after reading our lead article by Thomas Barish. The mechanical circuit between work and tool is no more rigid than the weakest link in that circuit. Barish describes a test method to find and eliminate these weak links.

Machinability . . . More and more is heard about the relation of micro-structure and machinability. A pair of Reference Book Sheets from Bethlehem Steel illustrate this relationship in carbon steel. They show the effects of rolling and combined rolling and drawing . . . The other RBS summarizes practice in the automotive industry for dimensioning for gage inspection.

Backfire . . . You've heard a lot from us on how to get the most out of machine tools. It's today's most important subject, so you'll hear a lot more. This issue brings support from B. P. Fortin, Sr., who warns that "Slow Tools Will Backfire," with examples to prove his point. They're drawn from years of practical experience.

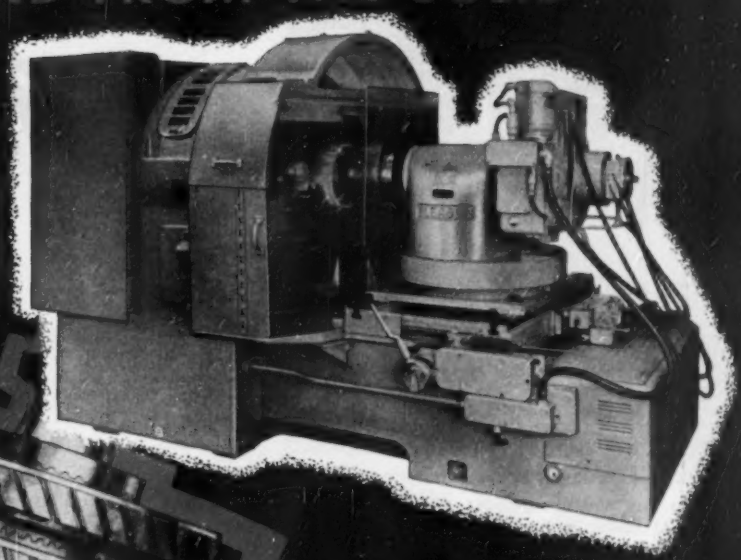
Tips on Turrets . . . The turret lathe is so flexible that it is not always used in the most efficient way. To point the way to proper application of this common machine tool, E. L. Murray of Warner & Swasey outlines the eight fundamentals the user should follow for effective turret-lathe operation.

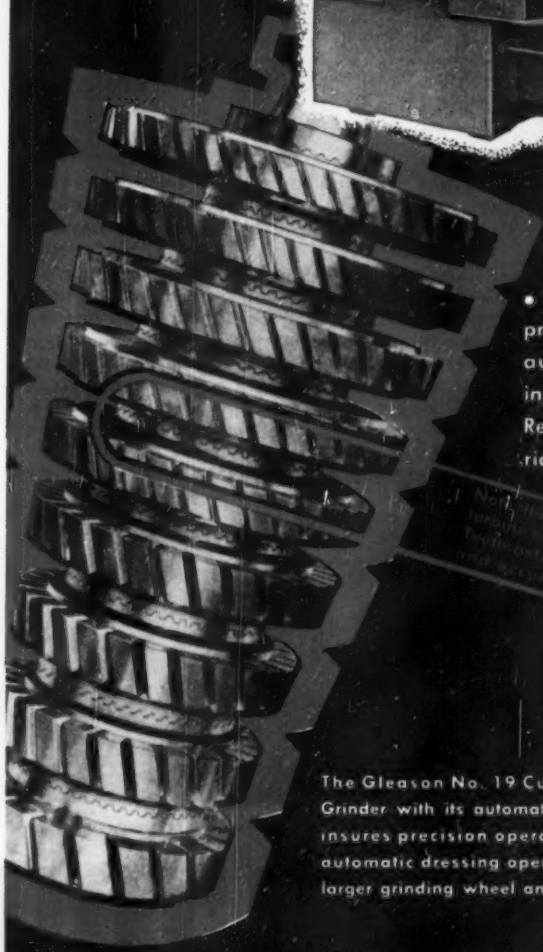
Production Lapping . . . Now that production men have to think in millionths more and more frequently, lapping is taking on new importance as a production process. Production work is regularly being turned out that is accurate to 25 millionths and you can get 1 millionth when you have to. Associate Editor Miles Rowan has spent a humid summer assembling all the available material on the new wrinkles in this old process, with special emphasis on general-purpose mechanical lapping.

Coming . . . Oct. 16 *AM* will be the Metal Show Number, and behind the cover painting by Van Gorp we've lined up a number of appropriate features. The Special Report is the first of two on the working of tool and die steels. This will delve into the latest methods of classification and summarize the data on selection, forging, heat treatment, and machining. Articles include the first of a series on carburizing, plus articles on trim-die operations, vibration isolation for forging hammers, and automatic stud welding. You'll find complete details on the Show, including our "Show in Print"—a guide to what's new among the exhibits.

CONSULTANT . . . Thomas Barish graduated *cum laude* from Columbia in 1917, got his ME three years later. After several years with SKF working on bearing applications and designs, he was chief engineer of Wollmar Engineering Co., then assistant chief engineer for Marlin Rockwell. During World War II he was manager of the Propeller Div., Engineering & Research Corp., where he developed the "Compreg" blade used in a Hamilton hub on trainers. As a consulting engineer for Lycoming he designed a controllable propeller in 1935 that is now produced by Aeroproducts Div., GM. For the past five years he has been an independent consulting engineer. Mr. Barish has 17 patents to his credit all but three of which are in active use or are now under development. Based on his work in controlling vibration in machine tools, he is the author of our lead article, "How to Locate the Weak Link in Machine Tools."

INTERCHANGEABLE COUPLINGS GROUND FROM THE SOLID





• The Gleason No. 19 Curvic Coupling Grinder produces ground Curvic and Zerol face couplings automatically with a uniformity of machining which makes each part interchangeable. Replacement costs of large units can be materially reduced by using built-up units employing the principle of the permanent couplings.

The Gleason No. 19 Curvic Coupling Grinder with its automatic cycle control insures precision operation while the automatic dressing operation provides larger grinding wheel and diamond life.

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CINCINNATI

CINCINNATI No. 2 Cutter and Tool Grinder. Available with plain or universal equipment. Catalog No. M-1618-2.

When you buy a cutter grinder, you're investing in efficiency of metal cutting on other machine tools. Through an unusual degree of versatility, ease of handling and accurate performance, CINCINNATI No. 2 Cutter and Tool Grinders give your shop a head start in attaining this end result of high metal cutting efficiency. And these machines offer a secondary advantage which will pay off years after they have been installed... new machine accuracy can be restored inexpensively in your own shop. Here's the point. Every machine is subject to wear, but there are only two elements in CINCINNATI No. 2's that may eventually wear and affect performance—antifriction slide ways and wheelhead spindle. Should they need replacement after years of service, *the job can be done by your own men in about two hours' time.* Replacement ways are hardened, ground to "dummy" units in our shop; the wheelhead spindle is completely assembled in a cartridge unit. Parts are in stock, ready for immediate delivery. ¶ Antifriction slide ways (replaceable); antifriction cartridge type spindle mounting (replaceable); dual table controls at front and rear; wide selection of attachments for sharpening all types of cutters including sintered carbide... these and other advantageous features give CINCINNATI No. 2's an A-1 investment rating in the cutter and tool grinder field. A few examples of their versatility are shown here. Write for literature.

THE CINCINNATI MILLING MACHINE CO.
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GRINDING A FACE MILL

GRINDING A SHELL END MILL

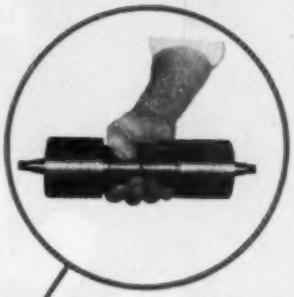
GRINDING A DOVETAIL CUTTER

REPLACE WITH A *NEW* CINCINNATI

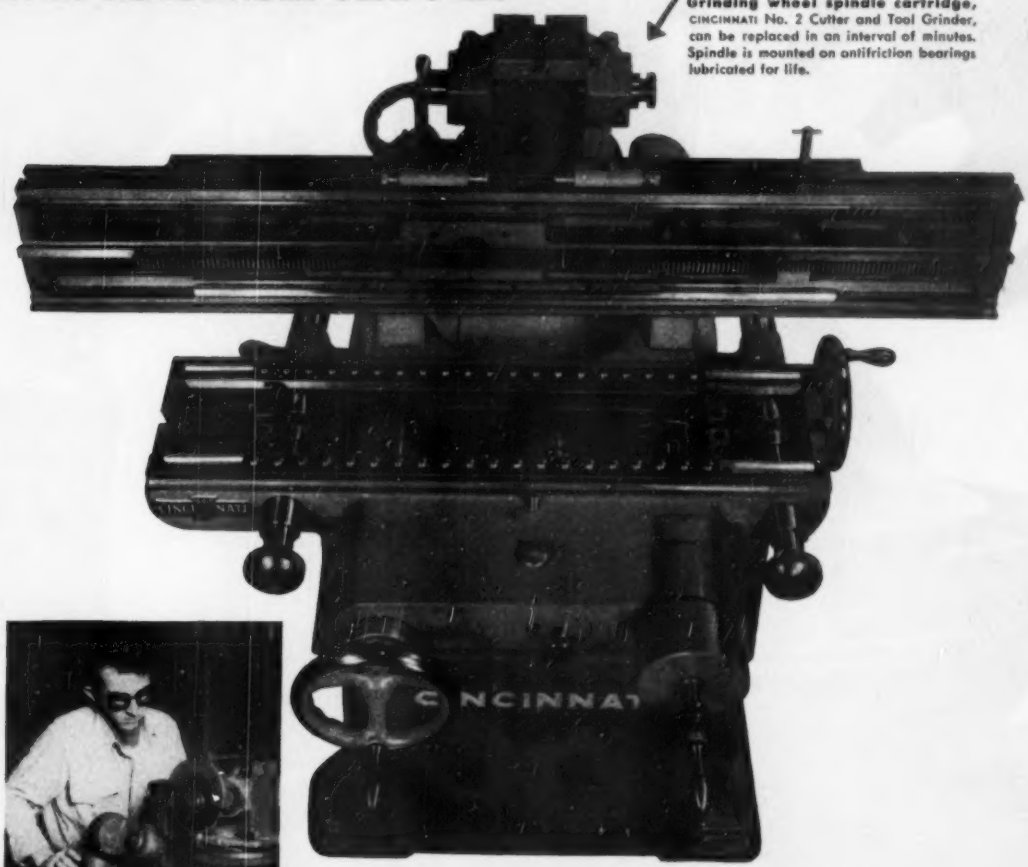
CINCIN

Metal Cutting

WITH RENEWABLE FEATURES



Grinding wheel spindle cartridge, CINCINNATI No. 2 Cutter and Tool Grinder, can be replaced in an interval of minutes. Spindle is mounted on antifriction bearings lubricated for life.



Antifriction ways, CINCINNATI No. 2 Cutter and Tool Grinder, are hardened and ground, easily replaceable.

GRINDING A FLANER TOOL

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
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If there's a Job to do on BIG GEARS

The Fellows 100-Inch Gear Shaper is at Your Command

Internal and external gears as large as 100 inches pitch diameter and 8 inches face width can be cut to a high degree of accuracy with ease and dispatch... Now available with a new relieving cutter-spindle, adapting the machine to the cutting of external and internal helical gears—as well as spur gears... Power, weight and rigidity to take heavy cuts on coarse-pitch work, and the precision necessary for the finer finishing cuts... All this is wrapped up in the Fellows 100-Inch Gear Shaper... Any one of the Fellows offices will be glad to supply complete data and specifications.

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Table: 45" x 10"

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Table: 37" x 9½"

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That Enables ONE Van Norman Ram Type Miller Do the Work of Several Single Purpose Machines

Conventional horizontal and vertical, as well as angular milling all on ONE miller . . . that's what you get with Van Norman Ram Type Milling Machines. The adjustable cutterhead, mounted on a movable ram, enables you to perform all types of milling by simply positioning the cutterhead in the desired position. Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

In addition, the movable ram in combination with the saddle cross feed increases the work range and capacity of work that can be handled.

Whether it is for toolroom, production, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers increase production and cut costs. A wide range of models in various sizes are available to fit most every application. Write for information.

VAN NORMAN COMPANY

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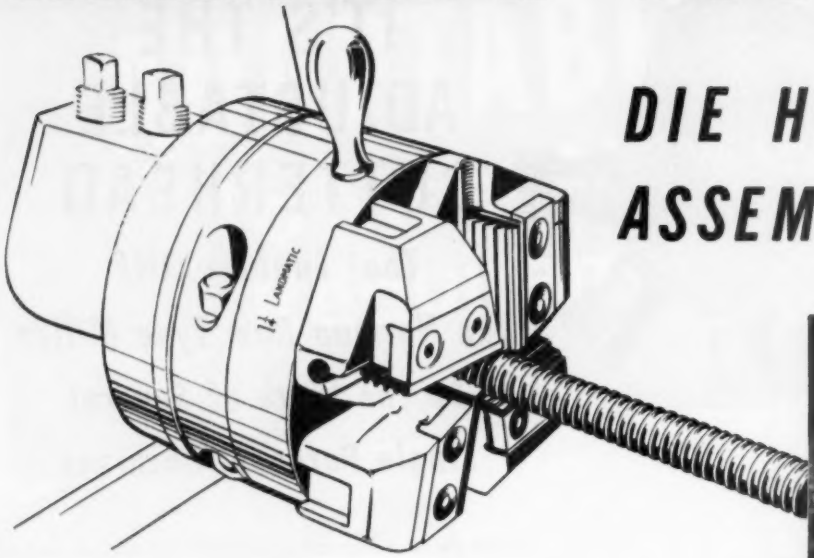
"It Pays to Van Normanize"

THREADING COSTS

DIE HEAD ASSEMBLY



Time Study and Methods Department records of a large aviation equipment company furnish data of still another job where LANDMATIC Heads have effected large savings in machine time and assembly and improvements in product quality.

In this operation, the 1¼" LANDMATIC Head on a turret lathe equipped with Leadscrew is cutting a ⅝-6 Acme thread on a Stabilizer Screw used by a light aircraft manufacturer. The thread was held to the close tolerance of ± .001 between the P.D. of the thread and the O.D. of the screw, for a full thread length of 5⅜" on cold-drawn piston stock, Spec. #AISI, B1112.

Former methods required two passes to produce the finished thread—one roughing and one finishing cut. The thread is now cut in one pass in .192 at a spindle speed of 230 R.P.M. Approximately 400 pieces are cut between chaser grinds. Hand fitting with the mating nut in assembly, previously necessary, has been eliminated. Total cost savings in all operations are in excess of 75%.

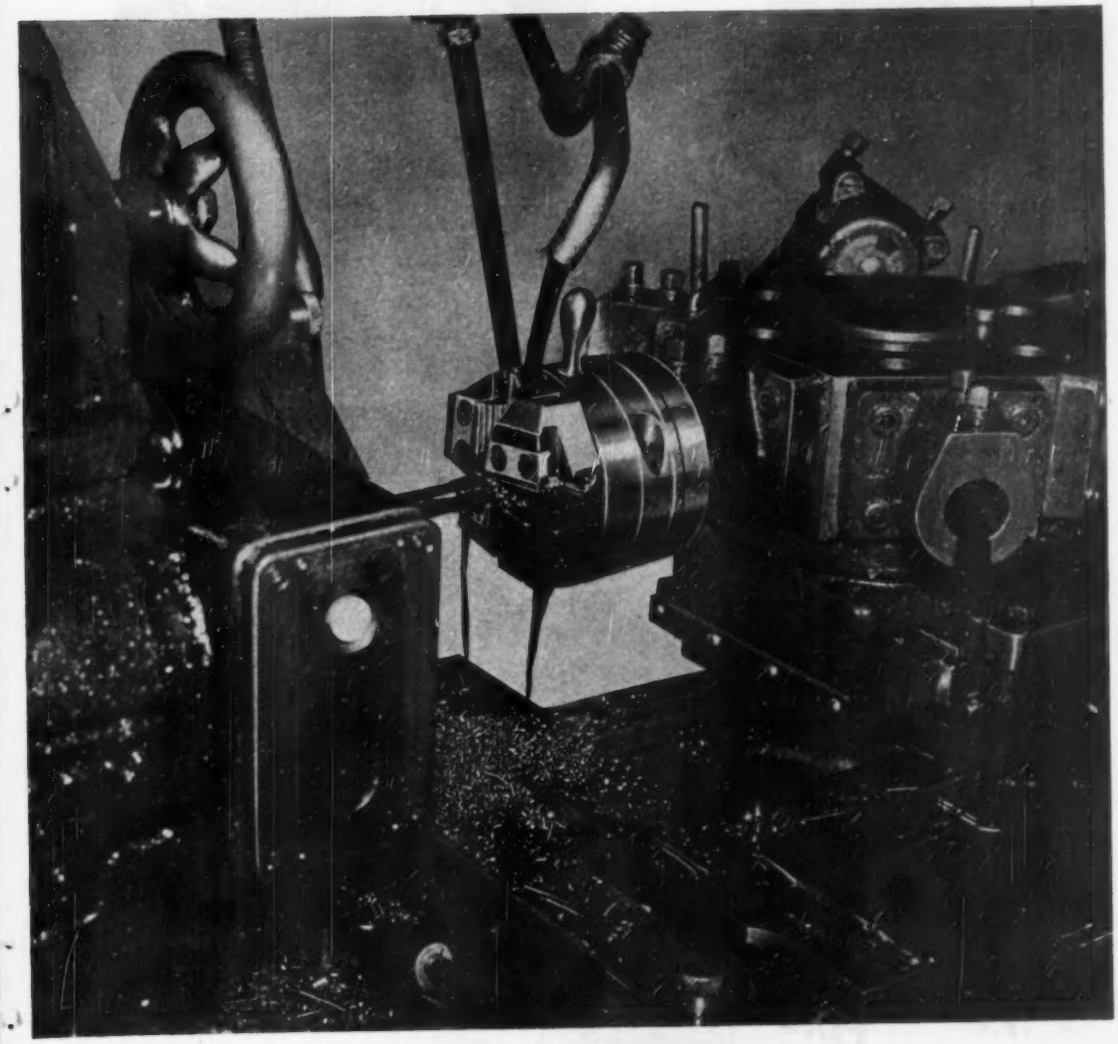
LANDMATIC Heads are stationary threading heads with self-opening action designed primarily for turret lathes. Their unusually-large oversize capacity makes them ideally suited for these machines. For detailed information and specifications, write for Bulletins F-80 and F-90.

LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA · U.S.A.

CUT BY OVER 75%

CUTS COST OF PRODUCTION & OF STABILIZER SCREWS!!



25-30% OVER-ALL SAVINGS*

EQUIPPED WITH MICROSPHERE BEARINGS

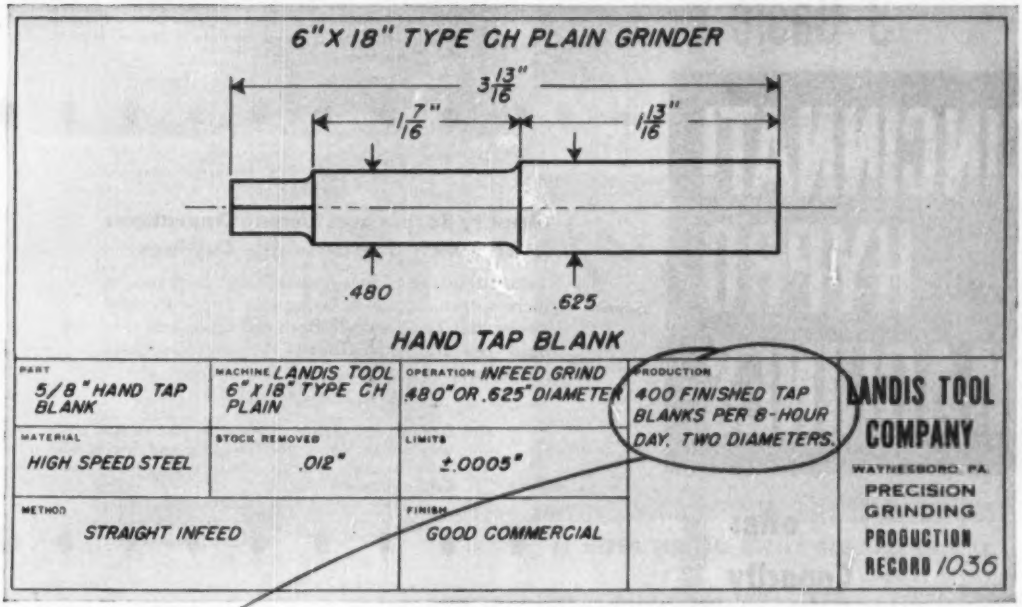
by replacing obsolete grinder with

* on all sizes of tap blanks ground. Specific information on one size shown on chart.

6" x 18" Type CH Plain Grinder.
Catalog B45

LANDIS TOOL
Precision Grinders

modern LANDIS TOOL precision grinder



Former production 280 complete tap blanks per 8-hour day.

121

MODERN HIGH PRODUCTION FEATURES

6" x 18" Type CH Plain LANDIS TOOL Precision Grinder

Semi-Automatic Cycle

Hydraulic infeed—to speed operating cycle.

Hydraulic timer—for positive spark out period.

Footstock Mounted Dresser—convenient for frequent wheel dressing required when grinding high speed steel.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

These 3 Basic CINCINNATI HYPRO MACHINES offer Capacity and Versatility for *unusual* Planing, Boring and Milling Operations

1 Profitable Use of an Angular Side Rail for Unusual Work

Easy modification of a standard *Hypro Double Housing Planer* may readily solve trying machining problems to your advantage. Tooling and work setups of this kind indicate cost reducing efficiency difficult to obtain on other types of machine tools.

Planing three traction motor housings is easily accomplished by modifying a standard Hypro Double Housing Planer. Note the angle of the journal bearing seats to the planer bed.

2 Simplify Boring and Turning Operations on Awkward-to-Handle Castings

Take advantage of many machining short cuts to increase production by using this *Hypro Vertical Boring and Turning Mill.* Both rail heads and side head operating individually or simultaneously means increase in overall work output.

Standard and special work can be handled more profitably on this Hypro Vertical Boring and Turning Mill. There is ample machine power to operate all heads simultaneously.

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This *Hypro Multiple Head Planer Type Miller* is adapted to a broad range of production milling operations. Performing a series of machining cuts simultaneously insures greater overall accuracy and at the same time reduces unit cost.

The machining method followed with this Hypro Multiple Head Planer Type Miller assures maximum accuracy of finished bed castings. Cincinnati's overall "packaged service" includes all tooling.

EXPERIENCED HYPRO ENGINEERS WILL SHOW YOU HOW—Depend upon men experienced in solving difficult machining operations. Call in Cincinnati Hypro engineers for machine and tooling recommendations, or send prints indicating operations.

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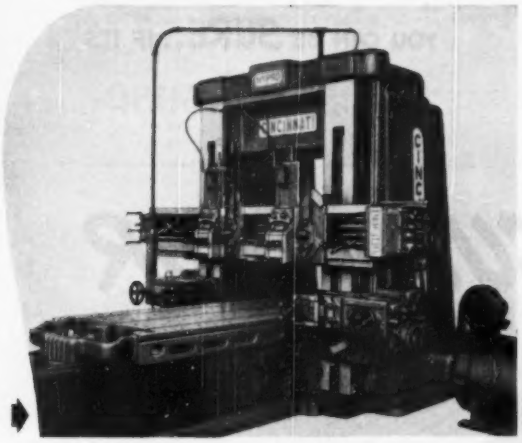
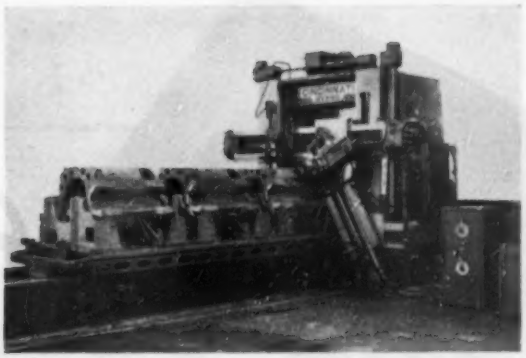
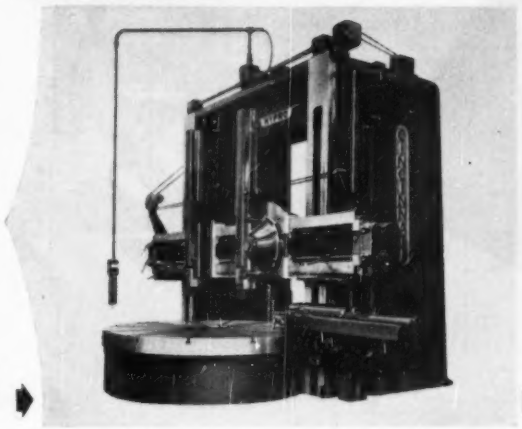
THE CINCINNATI

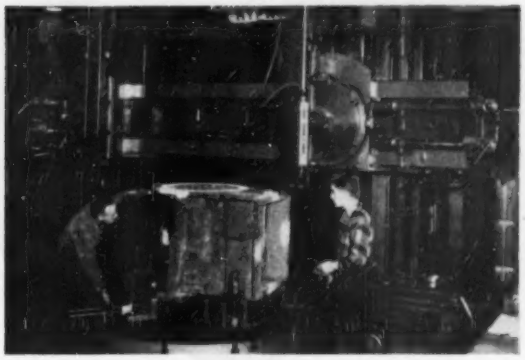
Subsidiary of Giddings & Lewis Machine





HYPRO DOUBLE HOUSING PLANER





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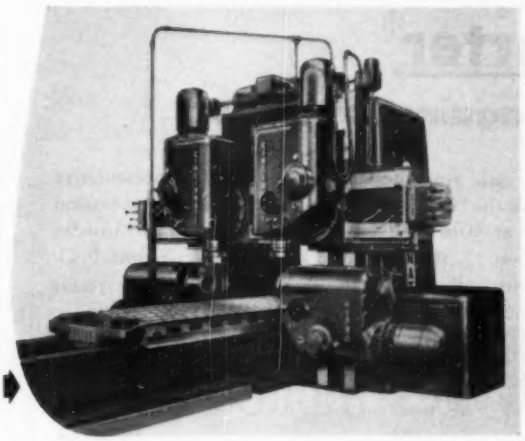

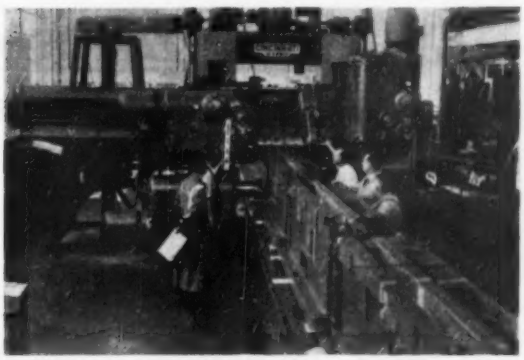

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PLANER COMPANY

Tool Company, FOND DU LAC, WISCONSIN, U.S.A.

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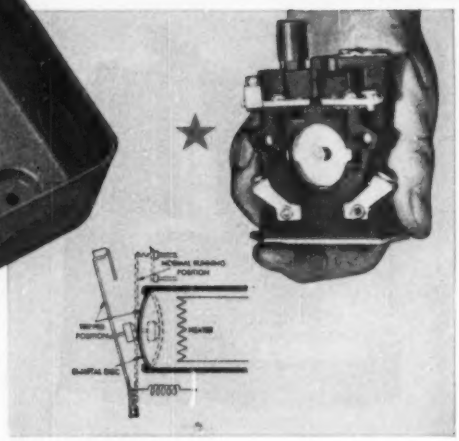
Westinghouse

CUT MOTOR BURNOUTS



with the *Life-Linestarter**

. . . positive protection against overloads

Stop worrying about the inconsistencies of ordinary overload relays.

Investigate the new Westinghouse Life-Linestarter with the bi-metal DISC overload relay which provides a positive contact pressure, with snap action. It retains its precise calibration regardless of the number of operations. It's the only relay that may be set for "automatic", "hand" or "no-stop" operation.

Positive protection is but one of the advanced features offered by the new Life-Linestarter. It's best because of its uniformity and completeness of line (NEMA sizes 0 through 4, to 100 hp, 600 volts), superior performance, ease of installation and other cost-saving advantages.

**Trade Mark*

Ask your nearby Westinghouse representative for the "inside story"—a Trans-Vision presentation —at your convenience. Or write for booklet B-4677. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-30024

Westinghouse

Life-Linestarter

TOMORROW'S STARTER—**TODAY!**

IN A BUSINESS DEAL there are often three parties involved—the man who got the order, the man who got consideration, and the man who wasn't even called in.

Usually the "Third Man" is the representative of a company that neglected to replace obsolete equipment with today's high productive machines . . . a company that can't stand up against alert competition.

When metalworking orders are involved, No. 1 and No. 2 get the business and you will find that they represent the plants with the most up-to-the-minute tools.

Don't be caught whistling the "Third Man Theme."

Put your plant on a profit-making basis by getting an analysis of what can be done in your shop to increase efficiency . . . reduce production costs. Call your nearest Warner & Swasey representative today.

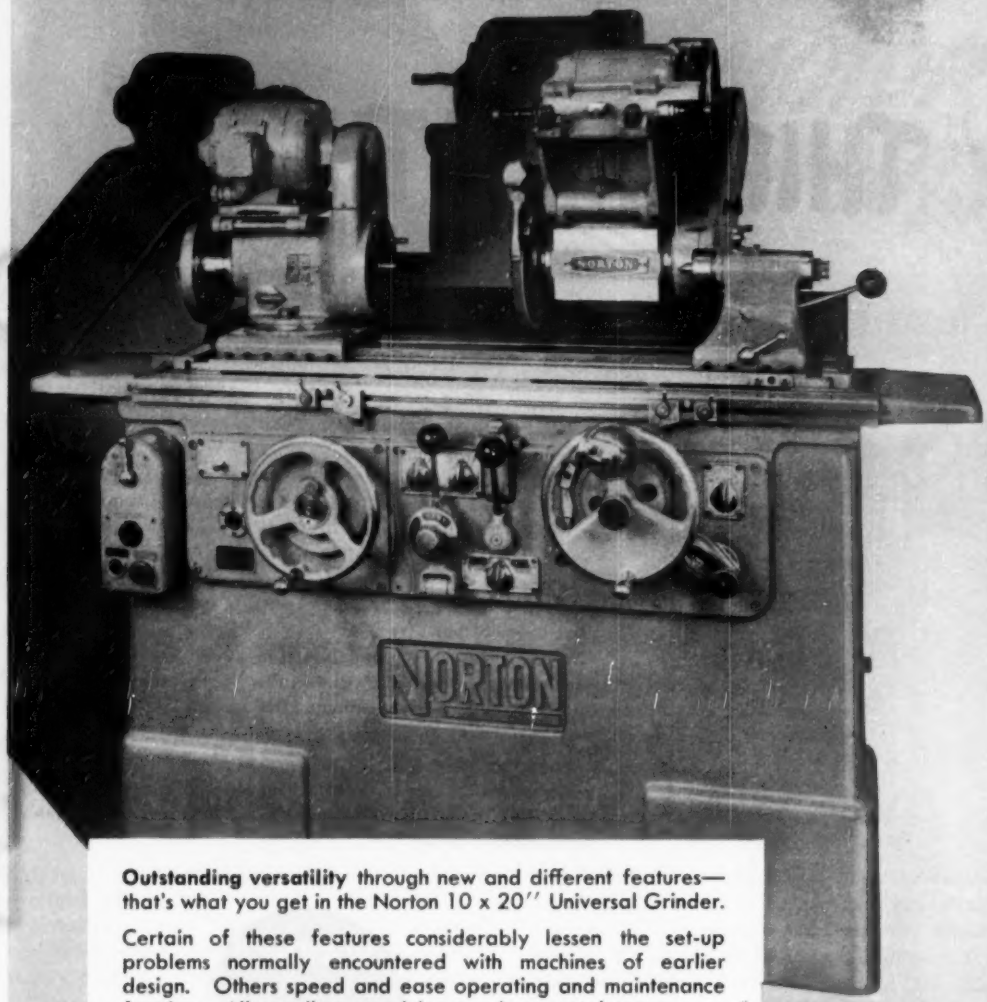
WARNER & SWASEY
Machine Tools
Cleveland

Warner & Swasey Sells One Thing...
INCREASED PRODUCTION

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Do a Variety of Grinding Jobs EASILY

with the VERSATILE Norton 10 x 20" Universal



Outstanding versatility through new and different features—that's what you get in the Norton 10 x 20" Universal Grinder.

Certain of these features considerably lessen the set-up problems normally encountered with machines of earlier design. Others speed and ease operating and maintenance functions. All contribute to giving you lower total costs.

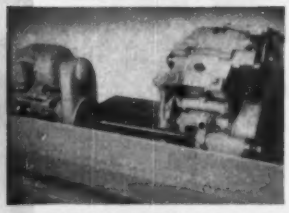
Catalog No. 170-2, supplied without obligation, graphically illustrates with pages of pictures the many convenience features and design highlights. →

Planned replacement pays dividends

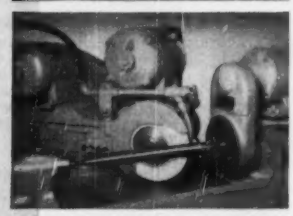
Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Pipe · Mixers · Non-Slip Floor · Norbide Products · Labeling Machines

CAM LOCK NOSE on this end of headstock spindle permits attachment of conventional or speed chucks in a matter of seconds.

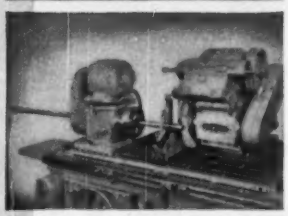
COMPOUND WHEEL SLIDE design permits swivelling of wheel head to any angle and wheel feed at any angle.



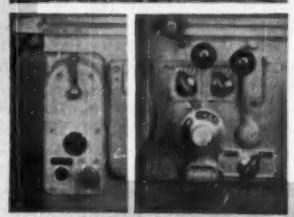
HINGED TYPE WATER GUARD extending full length of swivel table prevents objectionable spatter of coolant.



INTERCHANGEABLE HEAD and FOOTSTOCK greatly eases set-up problems encountered with many jobs.



HOLLOW SPINDLE in HEADSTOCK permits work up to 1″ in diameter and 30″ or longer to be passed clear through.



START, STOP, and WORK JOG CONTROL positioned for maximum convenience (left). **PRESET TRUING SPEED CONTROL** eliminates need for disturbing table speed settings during truing.

NORTON
GRINDERS and LAPPERS

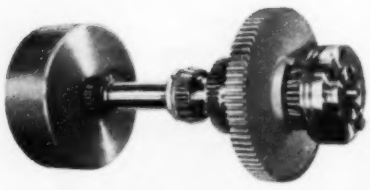
M-584

NORTON COMPANY, WORCESTER 6, MASS., New York, Chicago, Detroit, Cleveland, Hartford, Distributors in All Principal Cities

GREATER CUTTING EFFICIENCY

A new line of Knee-Type Milling Machines

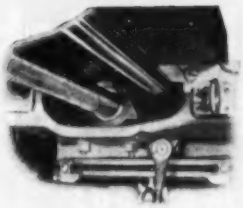
KEARNEY & TRECKER MILWAUKEE **CK's**



TAKE a look at the "business end" of a new CK milling machine — *the spindle* — with its dynamically balanced flywheel and Kearney & Trecker's famous extra-rigid, three-bearing spindle design. Added flywheel momentum gives you smoother, more positive cutter drive — the key to *Greater Cutting Efficiency* using modern cutting tools. Yes, and you get increased cutter life, too. The three-bearing spindle design affords ample support and greater rigidity — regardless of cutting loads. Heavy duty wide-faced spindle drive gears of forged steel are specially processed for longer life and exceptionally smooth, quiet operation. But this tremendously efficient spindle is only one of many pace-setting CK features. Look at the other features, too. See how they combine to give you the most productive, most profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an

GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

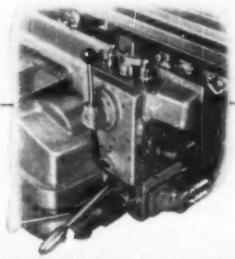


SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.

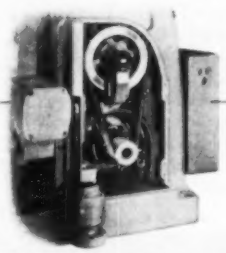
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

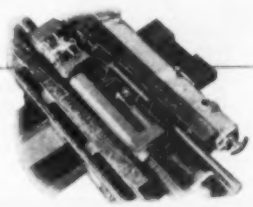
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from 3/8" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK line of knee-type machines is designed to meet every demand of present-day milling . . . making them more accurate, and MORE PRODUCTIVE for you. Contact your Kearney & Trecker representative or write direct to obtain their complete specifications. Find out how CK machines easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

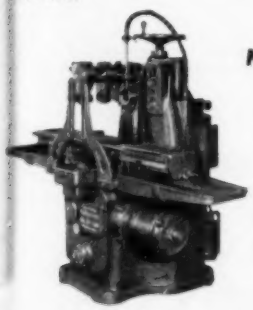
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

investment that makes Dollars and Sense.

FOR { BIG Milling Jobs or Small, Simple or Complicated—

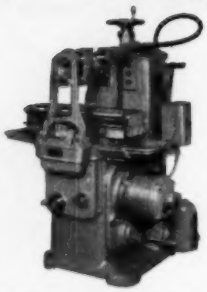
You'll get Better Methods, Lower Costs from Sundstrand "Engineered Production" and Equipment

Here are eight standard basic Sundstrand Rigidmil designs which have been tooled in various ways to lower production milling costs. Countless plants using these machines with Sundstrand production engineering methods and accessories have found these machines most productive and economical. Call in a Sundstrand engineer to assist you with your milling operations. There is no obligation for this service.



MODEL 0

Many outstanding production increases have been obtained with this Model 0 hydraulic Rigidmil. They are a direct result of improvements in manufacturing methods made possible by the time-saving features of this machine.



MODEL 00

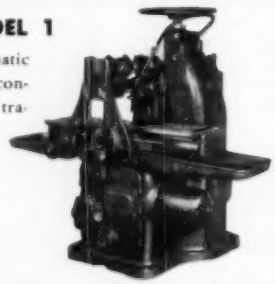
For milling operations on lock, business machine, typewriter, gun parts, keys, etc., the No. 00 hydraulic Rigidmil offers many possibilities for increasing production and lowering costs and reducing operator effort.

BASIC SPECIFICATIONS

MODELS	00 HYDRAULIC	0 HYDRAULIC
TABLE — Feed Stroke, inches	8	12, 18
Table Widths, inches	7-1/2	8
Feed Rates, ipm	1/2 to 37 1-1/4 to 65	1/2 to 38 1-1/4 to 67
SPINDLE — Endwise Quill Adjustment	1-3/4	1-3/4
Vertical Adjustment from C/L of Spindle to top of Table — Inches	1-1/2 min., 9-7/8 max. or 1-1/2 min., 12-7/8 max.	2 min., 13 max
Spindle Nose	No. 40 N. M. T. B. A. Standard	
Spindle Speeds, rpm	57 to 3600 (In 2 Models)	25 to 2400 (In 2 Models)
MOTOR — Spindle Motor, hp	3/4	1-1/2

MODEL 1

This model with its automatic table cycles, quick acting controls and high rate of rapid traverse offers high production possibilities for milling small parts.



MODEL 22

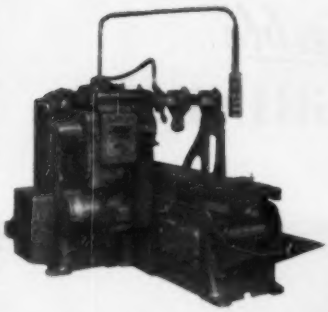
Available in simplex or duplex types, this mechanical feed milling machine offers great production possibilities on medium size parts.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

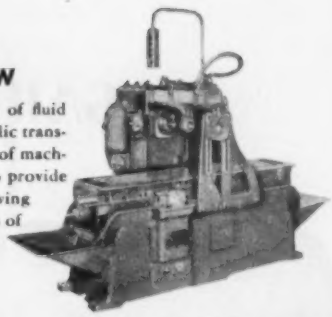
MODEL 33 MECHANICAL

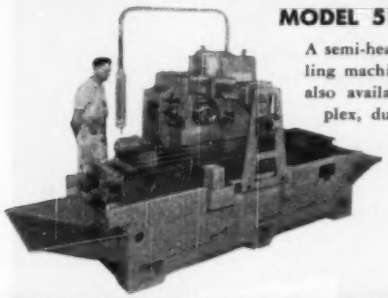
Climb and conventional milling, 100 to 1 ratio feed range are only 2 of the many features of this machine. It is available in simplex, duplex or triplex types.



MODEL 33 FLUID SCREW

Has combination of fluid motor (or hydraulic transmission) control of machine table screw to provide a feed method having all the advantages of both hydraulic and mechanical feed.



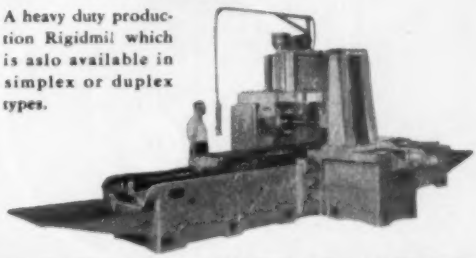


MODEL 55

A semi-heavy duty milling machine which is also available in simplex, duplex or triplex types.

MODEL 66

A heavy duty production Rigidmil which is aslo available in simplex or duplex types.



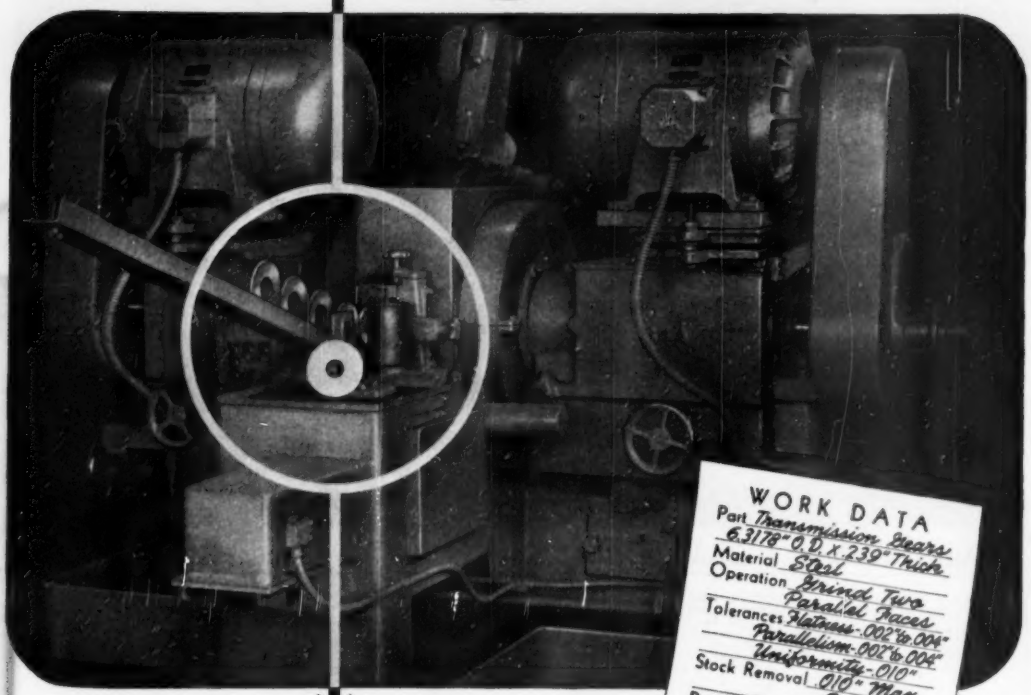
1 HYDRAULIC	22 MECHANICAL	33 MECHANICAL	33 FLUID SCREW	44 MECHANICAL	55 MECHANICAL	66 MECHANICAL
12, 18	24, 36, 48	48, 72, 120	48, 72, 120	48, 72, 96, 120, 144, 168	72, 96, 120, 144, 168	96, 120, 144, 168
10-3/8	12	14, 18, 24	14, 18, 24	18, 24	18, 24, 30, 36, 42	18, 24, 30, 36, 42
1/2 to 31 1-1/4 to 55	1/2 to 50 1 to 100	1/2 to 50 1 to 100	1/2 to 60 1 to 100	1/2 to 50 1 to 100	1/2 to 50 1 to 100	1/2 to 50 1 to 100
1-3/4	4	5-1/2"	5-1/2"	5-1/2"	8"	8"
3-1/4 min., 14-1/2 max.	3-1/2 min., 18 max.	4-1/2 min., 18 max. or 4-1/2 min., 21-1/2 max.	4-1/2 min., 18 max. or 4-1/2 min., 21-1/2 max.	4-1/2 min., 18 max. or 4-1/2 min., 21-1/2 max.	5-3/4 min., 20 max. or 5-3/4 min., 30 max.	9 min., 40 max.
	No. 50	No. 50	No. 50	No. 50	No. 50	No. 60
20 to 2400 (In 2 Models)	20 to 3200 (In 2 Models)	13 to 3600 (In 6 Models)	13 to 3600 (In 6 Models)	30 to 900 (In 2 Models)	25 to 1300 (In 2 Models)	10 to 600 (In 2 Models)
3 or 5	5 or 7-1/2	5 to 25	5 to 25	25 to 40	25 to 50	50 to 100

FREE DATA on each of these Sundstrand Rigidmils is available on request. Production figures and complete specifications are included. Ask for bulletin by specifying machine model.

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

Double GARDNER-GRINDING


WORK DATA
Part Transmission Gears 6.3178" O.D. x .239" Thick
Material Steel
Operation Grind Two Parallel Faces
Tolerances Flatness-.002" to .004"
Parallelism-.002" to .004"
Uniformity-.010"
Stock Removal .010" Max. Overall
Production 4 Pieces Per Minute
Feed Feed-Thru with Inclined Trough
Machine No. 84A-30" Gardner Grinder with Feed-thru Fixture

a short-cut to cutting costs

Precision grinding of two parallel faces of these transmission gears in one pass through this No. 84A-30" Gardner Double Grinder means a saving in TIME, MAN-HOURS and COSTS. Hundreds of Gardner Grinders are effecting these savings for manufacturers everywhere. Investigate how you, too, can introduce this economy into your plant — with Gardner Double Grinders.

Ask for our DOUBLE-GRINDING Bulletin!

GARDNER MACHINE COMPANY

410 EAST GARDNER STREET . . . . BELOIT, WISCONSIN, U.S.A.

92 hrs. of heat treatment

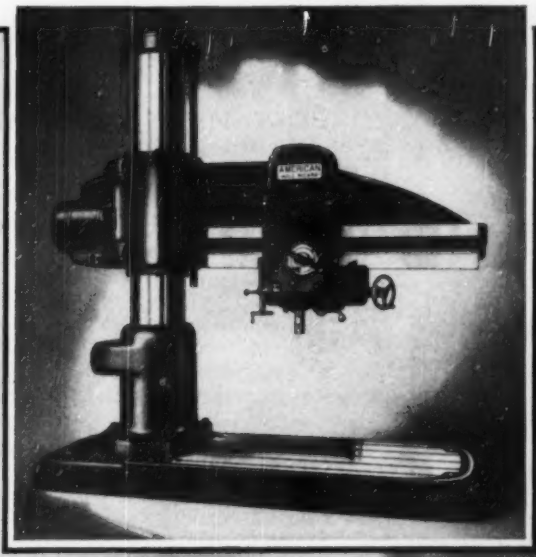
. . . required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

machined and *Assembled* in *One Chucking!* with GISHOLT TURRET LATHES

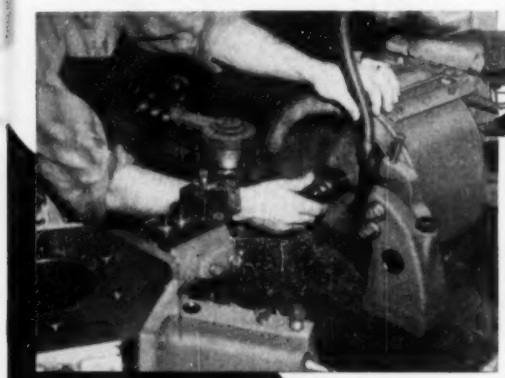
Talk about clever ideas! Here's one used by the Ansul Chemical Company, manufacturer of dry chemical fire extinguishers, to cut time, cut costs and do a better job.

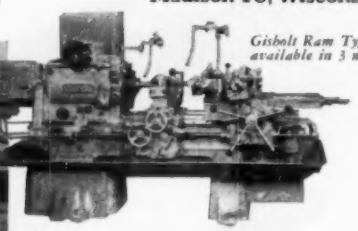
Eight different operations on these gas pressure cartridges are performed on a Gisholt No. 5 Ram Type Turret Lathe as follows: Turn, face, bore, thread, tap, attach splined collar, groove collar, and roll edge. And all in one chucking!

Combining all these operations on a Gisholt Turret Lathe eliminates another handling and welding operation—saves from 30% to 40% of former time. What's more, it has resulted in more uniform work and better appearance.

It's another example of using ingenuity to save money. Gisholt engineers are ready to give you the best of their experience—to help cut *your* time and costs. Write us.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin





Gisholt Ram Type Turret Lathes are available in 3 models with standard chuck sizes ranging from 8" to 15".

While part is still turning, splined collar is placed over neck of cartridge. Collar is then grooved and rolled to insure a snug fit that prevents turning or loosening.

GISHOLT

The Gisholt Round Table *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcome here.*

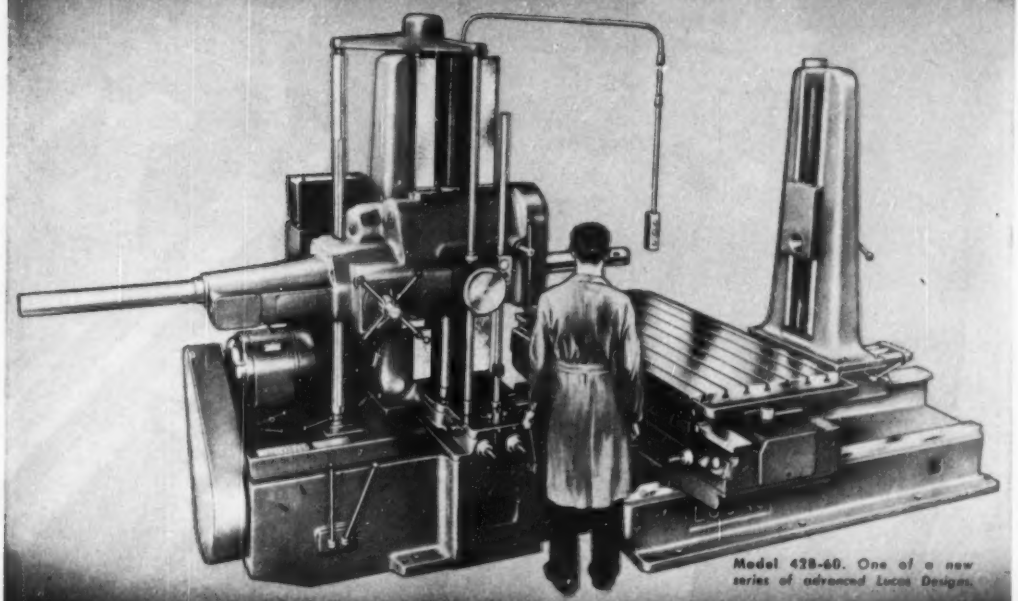
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

FIFTY YEARS LUCAS OF CLEVELAND ONE PRODUCT

LUCAS

Precision

Horizontal Boring, Drilling and Milling Machine



Model 428-60. *One of a new series of advanced Lucas Designs.*

Both a tool room *and* a rugged production machine. It can be *automatically power positioned* without the use of jigs and fixtures. Positively repeats a series of operations on any required number of large or small pieces.

Built in 3", 4", 5" and 6" diameter spindle models, all with a choice of two-way or four-way beds. Unit feed selection through manually operated directional control levers or through electrical multi-position pendant is optional on some models. May we send you descriptive literature.

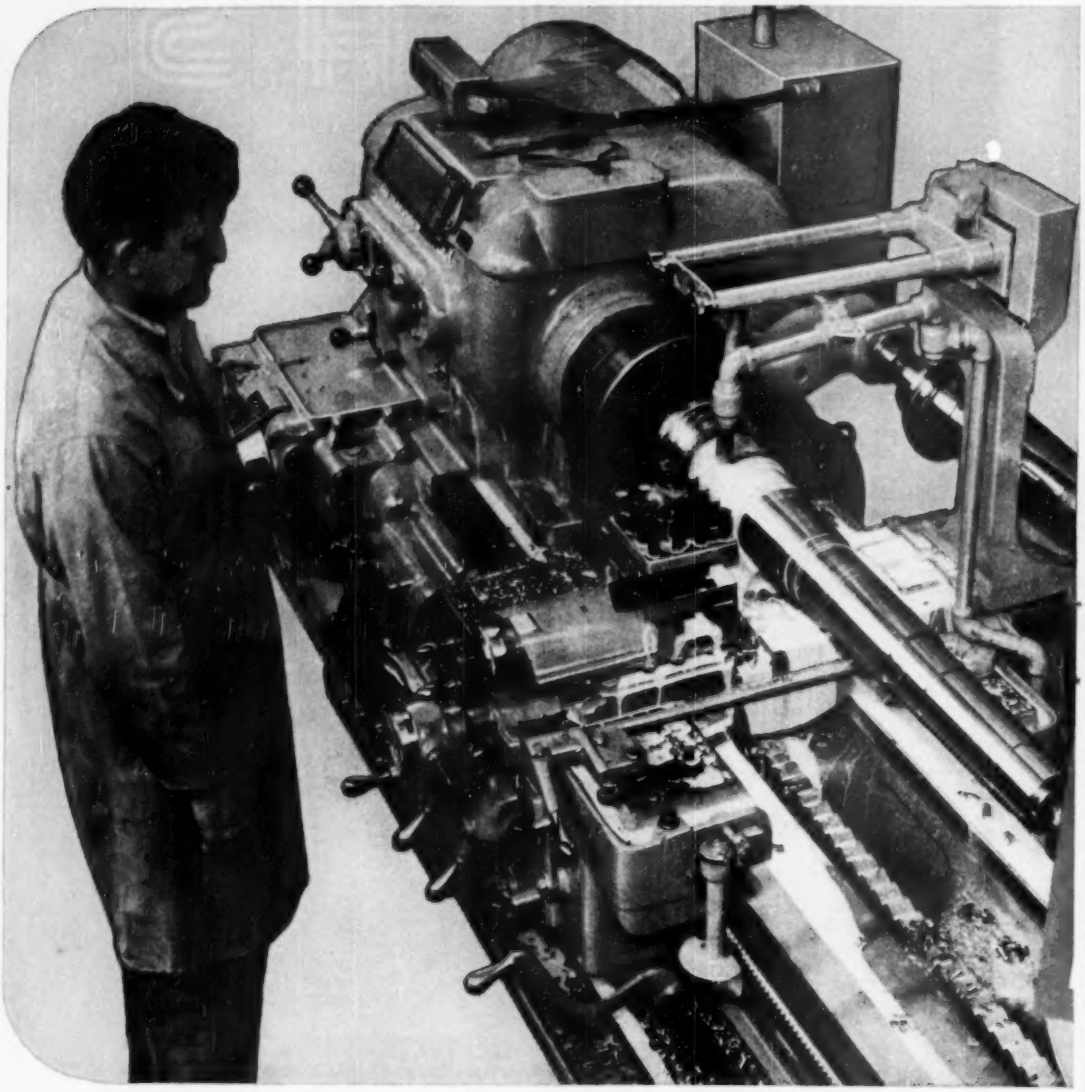
LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES

LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.

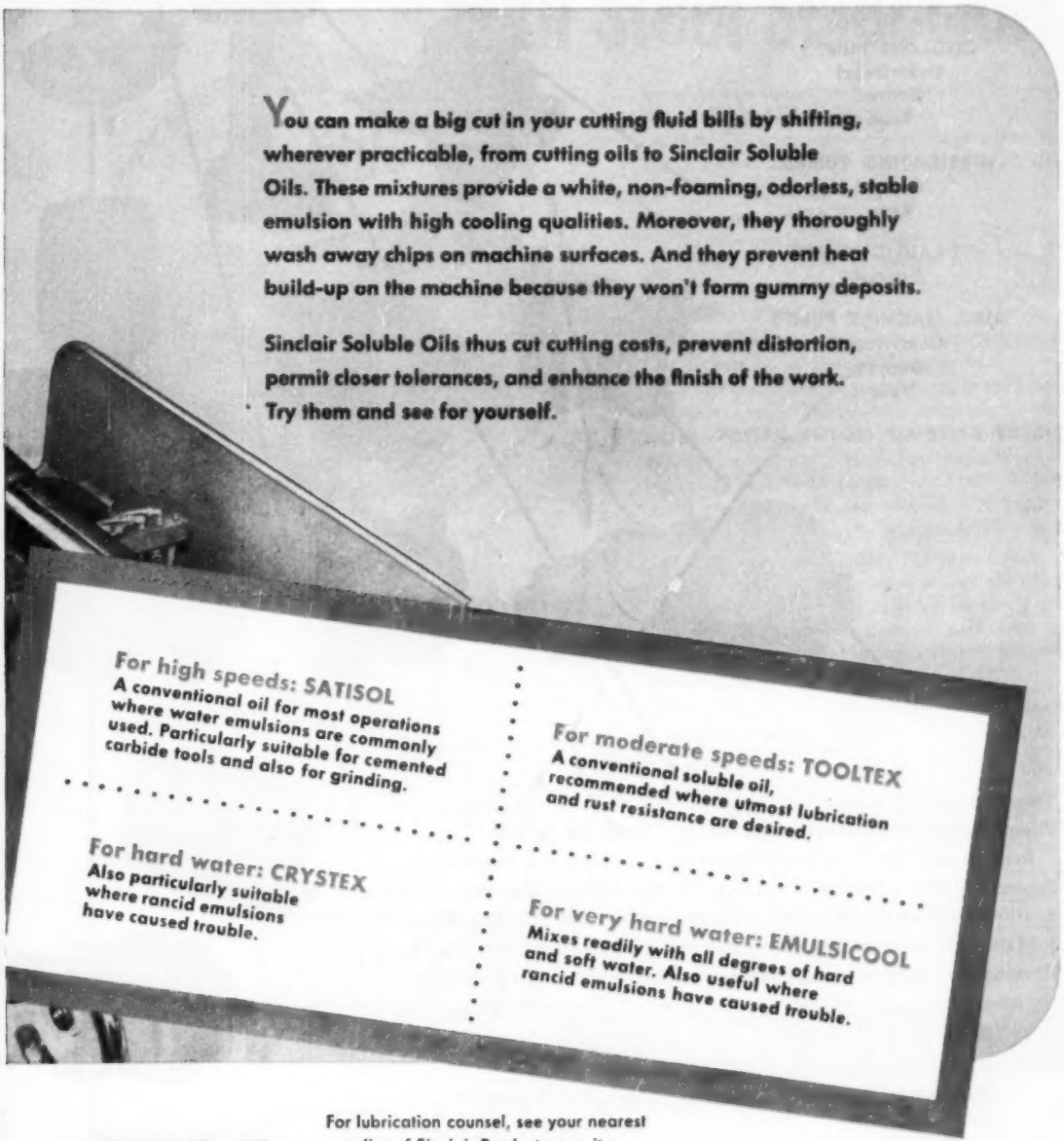
CLEVELAND 8, OHIO

Cut Cutting Costs with



SINCLAIR INDUSTRIAL

Sinclair Soluble Oils



You can make a big cut in your cutting fluid bills by shifting, wherever practicable, from cutting oils to Sinclair Soluble Oils. These mixtures provide a white, non-foaming, odorless, stable emulsion with high cooling qualities. Moreover, they thoroughly wash away chips on machine surfaces. And they prevent heat build-up on the machine because they won't form gummy deposits.

Sinclair Soluble Oils thus cut cutting costs, prevent distortion, permit closer tolerances, and enhance the finish of the work. Try them and see for yourself.

For high speeds: SATISOL
A conventional oil for most operations where water emulsions are commonly used. Particularly suitable for cemented carbide tools and also for grinding.

For hard water: CRYSTEX
Also particularly suitable where rancid emulsions have caused trouble.

For moderate speeds: TOOLTEX
A conventional soluble oil, recommended where utmost lubrication and rust resistance are desired.

For very hard water: EMULSICOOL
Mixes readily with all degrees of hard and soft water. Also useful where rancid emulsions have caused trouble.

OILS

For lubrication counsel, see your nearest supplier of Sinclair Products or write Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.

THIS WIDE RANGE OF PUMPS MAKES SELECTION EASIER

COOLANT PUMPS
Centrifugal
Geared
Vane

LUBRICATING PUMPS
Geared
Vane

HYDRAULIC PUMPS
Geared

MISC. MACHINE PUMPS
Centrifugal
Geared
Vane

DIRECT DRIVE OR MOTOR DRIVEN

The wide variety of types and sizes available in Brown & Sharpe Pumps simplifies your selection of the right pump for the job.

Every pump in this line has distinctive features to assure economical, dependable long-life service. All have the same familiar standards of high quality that characterize Brown & Sharpe machine and tool equipment.

Make your selection with the help of our latest pump catalog. It includes illustrations, complete descriptions, installation dimensions and charts showing performance characteristics. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

We urge buying through the Distributor

BROWN & SHARPE PUMPS

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Crucible Steel Company of America
Dept. A, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

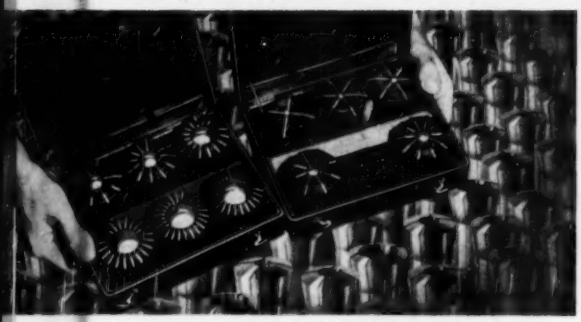
NEW COLLET CHUCK'S GREAT GRIP IMPROVES PERFORMANCE ON YOUR LATHE

Developing the tightest, most accurate grip ever devised in lathe collet equipment, Jacobs' new Spindle Nose Lathe Chuck delivers from two to four times more torque than split steel collet chucks.

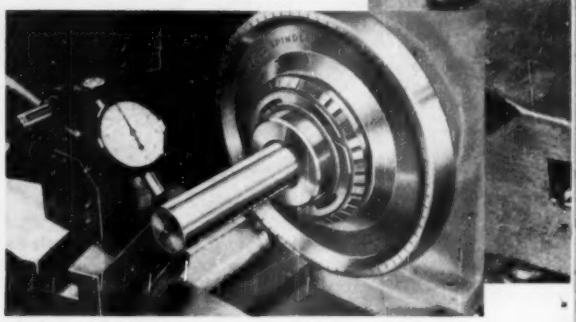
Work cannot slip under the heaviest cuts of the most modern tool room lathes. Despite this ruggedness, the unique design of the collets allows the softest, most fragile materials to be chucked without marring or scratching.

A big order? Certainly . . . but it's filled perfectly by this remarkable new chuck with its unique Rubber-Flex Collet. Multiple alloy steel jaws, hardened and ground, are bonded and mechanically locked together by Hycar synthetic rubber which will not set and is unaffected by heat, coolants or cutting oils. The collet's extra long steel jaws are always parallel to the work and the gripping load is thus distributed over the entire bearing surface. Result: accuracy and gripping power never before obtained in lathe collet chucks.

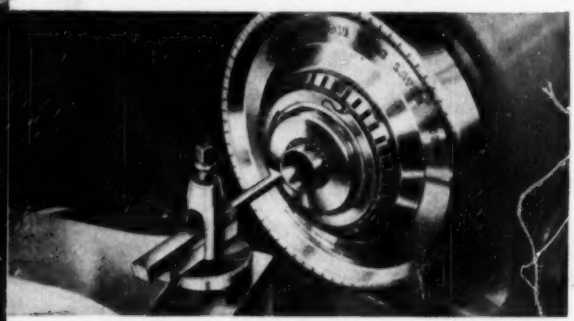
See your Jacobs distributor for bulletin 49-LC describing this new Lathe Collet Chuck.



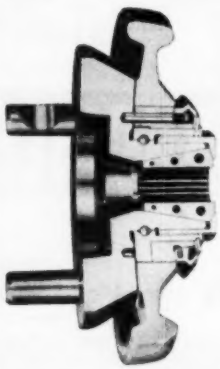
SO FEW DO SO MUCH . . . Each Jacobs Rubber-Flex Collet has a capacity of 1/8". Its grip is constant throughout this range. Only eleven collets are needed to chuck any bar from 1/16" to 1 3/8" diameter . . . contrasted with the 88 split steel collets needed to equal this chucking capacity by 1/64ths!



UNMATCHED ACCURACY . . . This chuck is designed to allow an unusual control of runout — it is the most accurate lathe collet chuck in the world today. The body is made from a single alloy steel forging. All bearing surfaces of the chuck and collets are of alloy steel, hardened and ground.

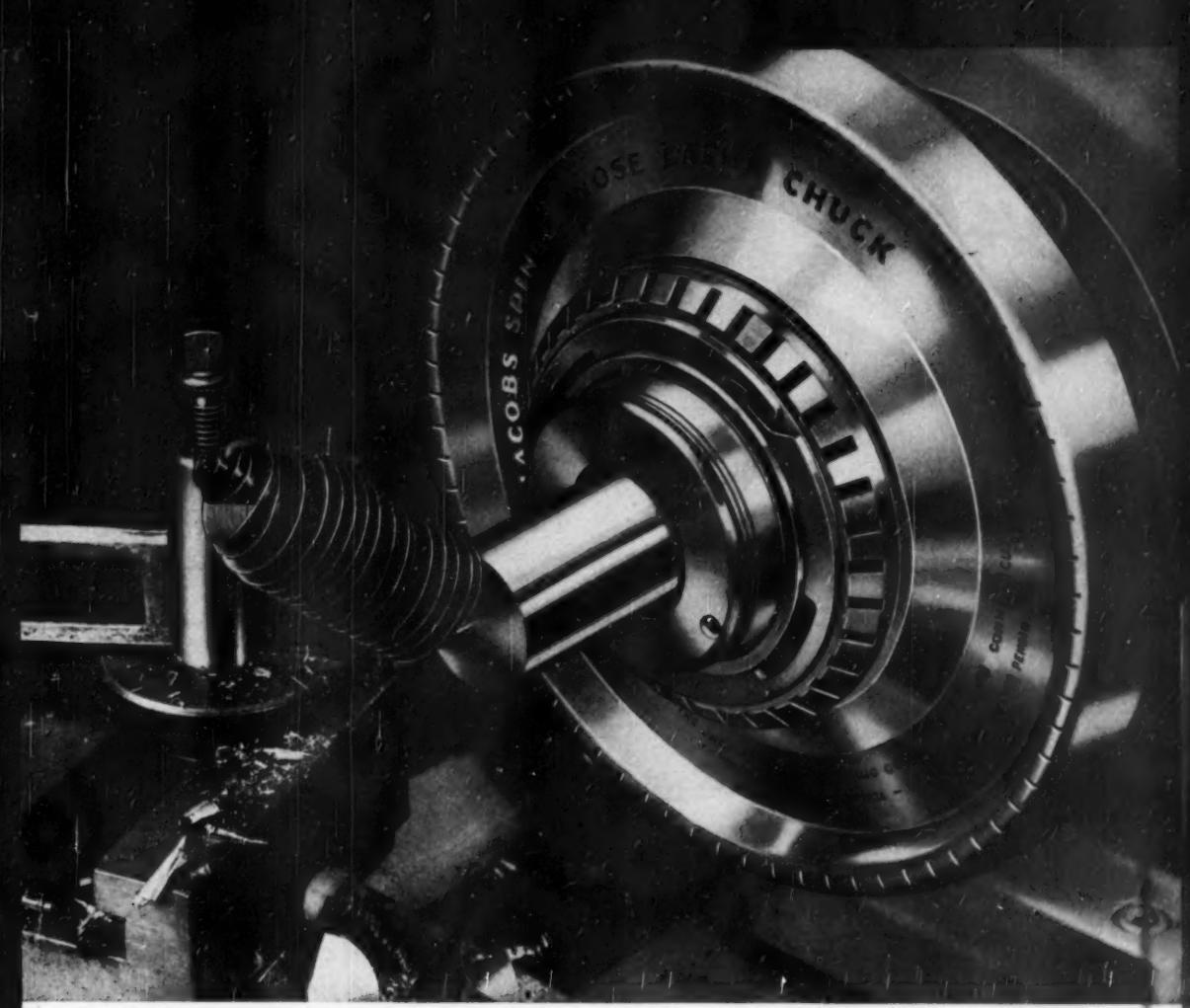


UNIFORM GRIPPING PRESSURE . . . permits the chuck to hold thin-walled tubes, plastics, wood and other fragile materials with no danger of marring or scoring. Grip is so evenly applied around circumference of work, no denting is possible.

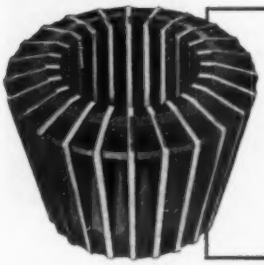


RUGGED CONSTRUCTION

All parts except solid aluminum hand-wheel are of hardened and ground alloy steel. Compact design saves 1½" of overhang compared with other chucks. Impact tightening mechanism opens and closes chuck with great ease.

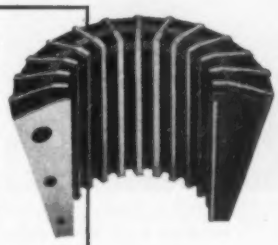


MAXIMUM FEEDS AND SPEEDS . . . Pictured above is a 1⅜" cold rolled bar being removed in a single pass with a feed of .008". Only the tremendous gripping power of the Rubber-Flex Collets permits this remarkable feat.



THE JACOBS RUBBER-FLEX COLLET

1. All external and internal surfaces precision ground.
2. The jaws in all collets have extremely long bearing surfaces in relation to the diameter.
3. Collet jaw bearing surfaces always parallel to and in full contact with work, assuring accuracy and gripping power.



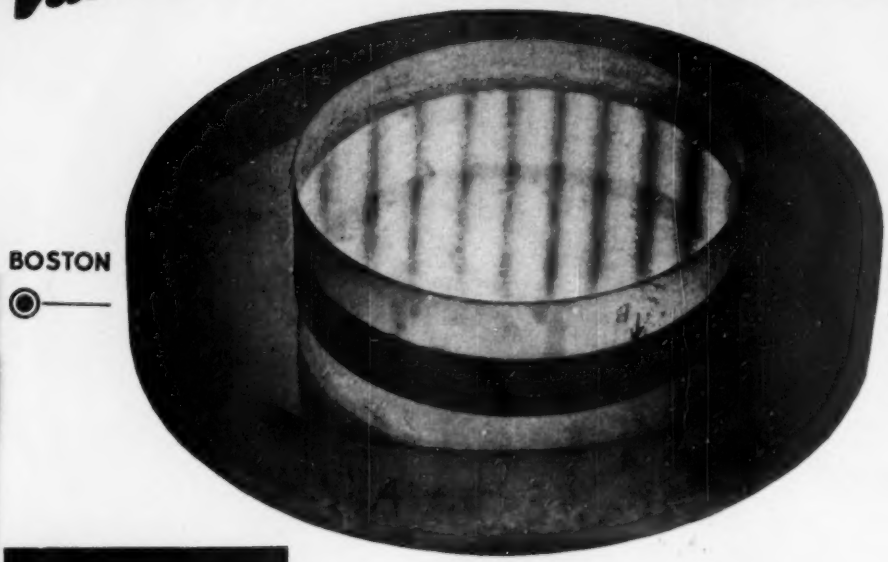
FOREMOST IN CHUCKS · FIRMEST IN GRIP ·

The *Jacobs* SPINDLE NOSE LATHE CHUCK

THE JACOBS MANUFACTURING COMPANY
15 Jacobs Road, West Hartford 10, Connecticut

If it's a JACOBS . . . it holds!

Van Keuren OPTICAL FLATS
are the proof of Precision



Detecting warn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

CATALOG AND HANDBOOK No. 34

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

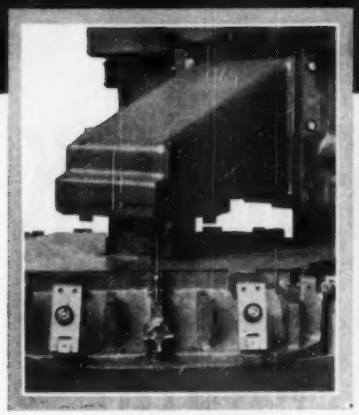
Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

NEWTON VERTICAL SPINDLE ROTARY CONTINUOUS MILLING MACHINES



CENTER SUPPORT
Furnished when required

DESIGNED FOR HEAVY MILLING WITH CARBIDE CUTTERS

This representative example of Newton high production milling machines has the advanced features required for heavy precision milling with carbide cutters and motors up to 50 H.P. An unusually rugged frame provides the rigidity necessary to such operation. On long work pieces such as automobile and tractor cylinder heads, 36" between spindles makes possible the completion of the roughing cut before the finishing cut starts. Independent pick-off gears for each spindle provide the means for correct cutting speeds for both roughing and finishing cuts. Heavy flywheels, solidly attached to each spindle, insure maximum cutter life between grinds. Intermittent feed—rapid traverse attachment and center support are optional. Two standard table sizes. Other table sizes and spindle center distances are available. Newton Milling Machines, applicable to your precision milling problems, will help to step up your production and reduce your costs. Complete information will be furnished upon request.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

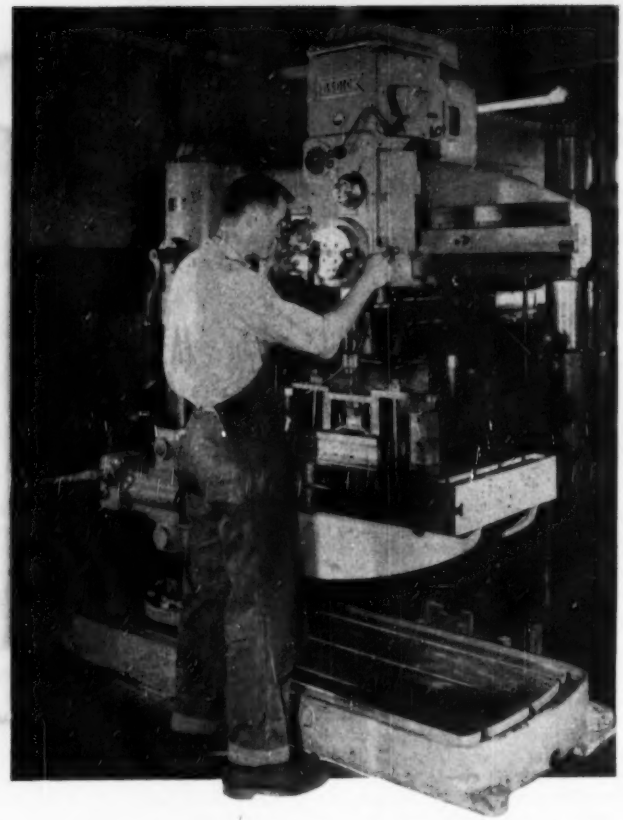
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

Wherever there are small jobs requiring holes up to 1½" diameter *You'll Find*

FOSDICK Sensitive RADIAL



Shown is one of the hundreds of Fosdick Sensitive Radials in action in shops throughout the nation.

The adaptability of the Fosdick Sensitive RADIAL in handling high speed sensitive drilling, reaming and tapping operations on a wide range of small jobs has made its use practical in both large and small machine shops.

For example, the sturdy base construction—the one-piece column—the heavy arm at fixed height provide the rigidity essential to maintain required tolerances. The adjustable table assures correct position of work for all jobs.

Controls are all conveniently located on the head making movement of the head—feed and speed changes exceptionally easy for the operator.

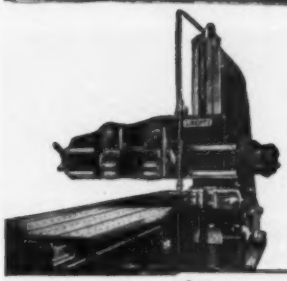
A recent improvement is the patented lighting feature exclusive to Fosdick Radial Drills. On this machine a 36" long fluorescent tube is mounted on the back of the arm in such a position as to eliminate glare from operator's eyes, yet provide illumination the entire width and length of the table.

If you are interested in the many economies provided by this Sensitive Radial, write for the new Fosdick Sensitive Radial Bulletin S. R. A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

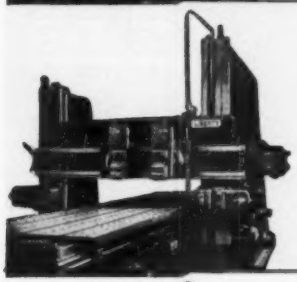
LIBERTY

BUILDS 3 *great* PLANERS



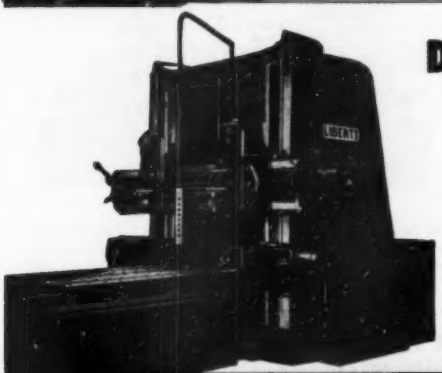
OPEN SIDE

For shops handling work of variable widths. Wide-faced housing and motorized clamp give rigidity for heavy roughing cuts and finishing. Dual control; electric feeds; rapid traverse to all Heads in all directions.



CONVERTIBLE

For exceptional rigidity on variable widths. Two, three or four heads. Offset heads permit closest approach of tools. Double balanced driving gear and pinions. Extreme accuracy.



DOUBLE HOUSING

For rapid production combined with accuracy. Two, three or four heads. Extremely rigid; handles production work with maximum cutting feeds and speeds. Table pulled into tool. Electric clamping and dual control for ease of operation; high production.

Write for catalog giving complete details.

All lengths, 24' x 24' wide and larger.

LIBERTY PLANERS, INC.

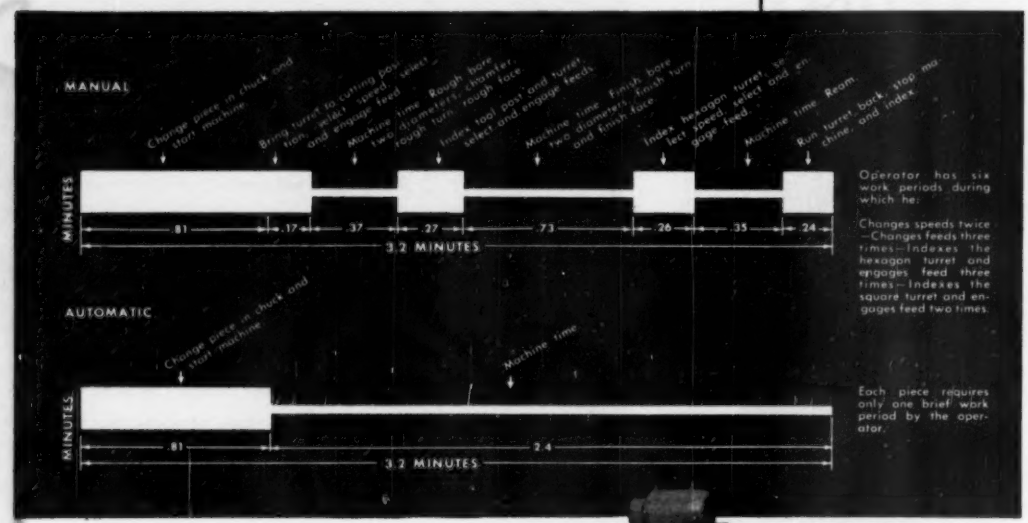
HAMILTON, OHIO

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

how the
GISHOLT FASTERMATIC
saves man-minutes and money!

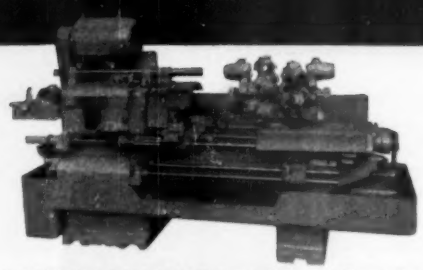
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine
Bring turret to cutting position, select speed and engage feed
Machine time Rough bore two diameters, chamfer, rough turn, rough face
Index tool post and turret, select and engage feeds
Machine time Finish bore two diameters, finish turn and finish face
Index hexagon turret, select speed, select and engage feed
Machine time Ream
Run turret back, stop machine, and index
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice—Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine
Machine time
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

Pick the men who changed to CIMCOOL

It's easy to spot the men who changed to Cimcool® — the radically new and different cutting fluid. You'll know them by their broad smiles. Naturally they're happy! For Cimcool covers 85% of all metal cutting operations. And does a *better job.*

This revolutionary cutting fluid—this *chemical emulsion*—replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned cutting fluids. It's longer lasting in machines, too. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

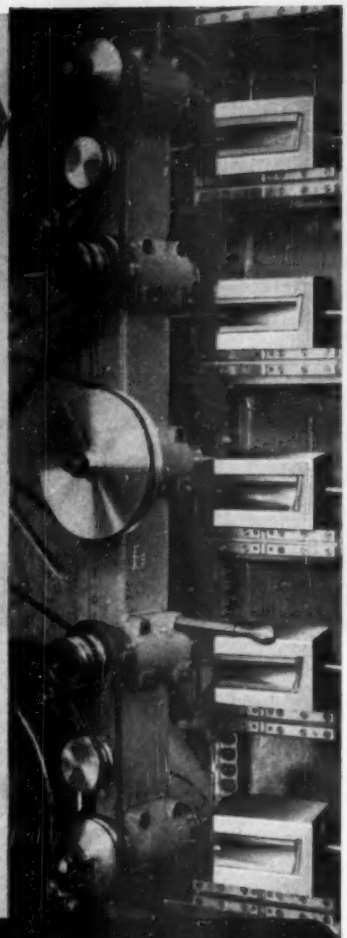
We sincerely believe that one week's run will convince you. And we'll be pleased to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, write for our free booklet "Cimcool Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

SMALL FORGING DIES PRECISION MACHINED *4 at a time*

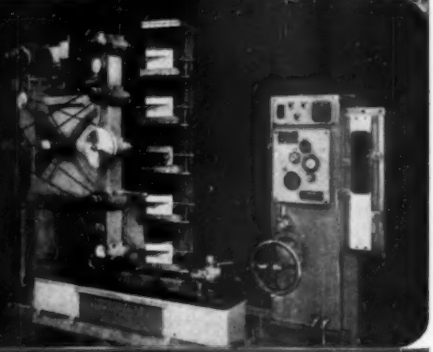
ON THE PRATT & WHITNEY AUTOMATIC DUPLICATING MACHINE

Sure way to step up the output of small forging dies — and drastically cut production costs — is to set them up as pictured: 4 at a time on the P&W Automatic Duplicating Machine. Four cutters do the job simultaneously and automatically on four die blocks, tracing the master form located at the central position so faithfully and precisely — with the machined surfaces so smooth and accurately detailed — that subsequent hand finishing is greatly simplified.



The setup illustrated is typical. The mechanical tracer point automatically follows every detailed variation of a master jet engine blade forging die, while the 4 cutters reproduce the exact contours in 4 blocks of tough die steel. After hardening, the dies are returned to the machine and finish-cut with P&W carbide burs producing air foil sections to within ±.001" of master. *Total machine time from the solid is 3 hours per block.*

Whatever the volume of your work, there's a P&W Automatic Duplicating Machine best suited to your forging die production. The P&W principle of precision-duplicating applies to small dies, as shown above, and to larger dies having impressions up to 24" x 16". P&W Duplicating Machines are available with single cutter spindle, 2 cutter spindles, or 4 cutter spindles. Get full information and specifications from your nearby P&W Branch Office.



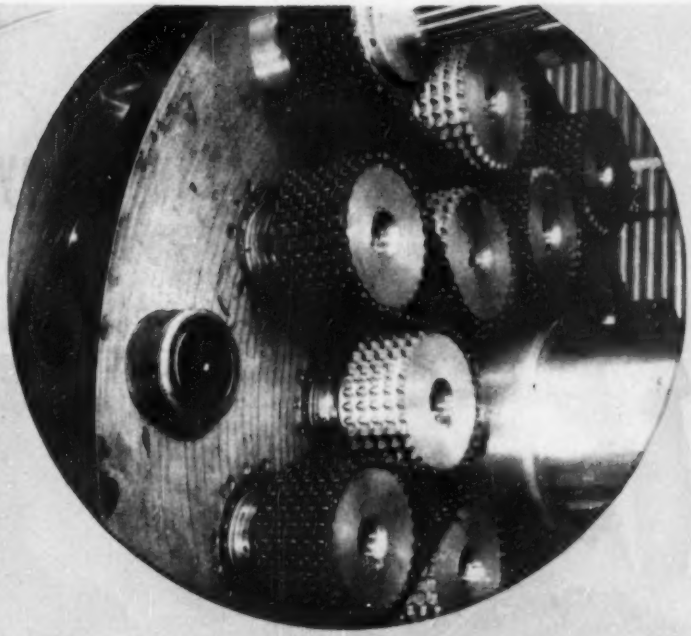
PRATT & WHITNEY

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

MACHINE TOOLS • CUTTING TOOLS • GAGES

90th P&W *Year*

SYMBOL OF ACCURACY SINCE 1860



Flexibility and ability to drive any number of shafts efficiently is clearly shown in this close-up illustration of Link-Belt Precision Steel Roller Chains and Sprockets driving spindles on automatic drilling and forming machine.

there's never a slip

with a LINK-BELT GRIP

Positive transmission of power and efficient conveying with compactness, wide flexibility of arrangement and ability to absorb shock are characteristics of roller chain, which are enhanced by the precision manufacturing methods and metallurgical control followed in the huge Link-Belt chain plant.

Link-Belt Precision Steel Roller Chain and Sprockets are available immediately, in single or multiple widths, in ⅜" to 2½" pitch. Also, with various types of attachments, as well as the double pitch and flat-top, crescent flat-top and universal flat-top chains. Made to manufacturers' A.S.A. standards.

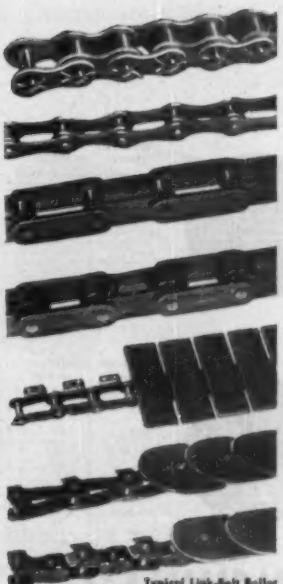
12,017-A

LINK-BELT
PRECISION STEEL
ROLLER CHAINS
AND SPROCKETS

THE SYMBOL OF QUALITY — LINK-BELT

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

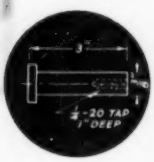


Typical Link-Belt Roller Chains for Conveying and Power Transmission

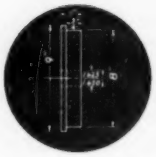
all in a day's work

on the Tray-Top Cintilathe

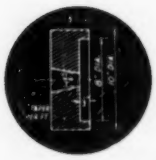
- **Small work diameters, large work diameters**
- **Alloy steels, soft steels, cast irons, non-ferrous metals**
- **Turning, facing, drilling, boring, reaming, threading, tapping**
- **Roughing cuts, finishing cuts**
- **Tools of high speed steel—tools of cemented carbide**



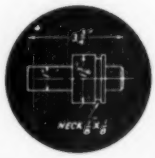
material:	aluminum	
tools:	H.S.S.	
operation	speed	feed
face	1200	.015
turn	1200	.018
ctr. drill	1200	H
drill	1200	H
tap	315	H



material:	CMM 320	
tools:	carbide	
operation	speed	feed
face	608	.018
ctr. drill	1200	H
turn	842	.020
neck	315	H
chamfer	449	H



material:	cast iron	
tools:	carbide	
operation	speed	feed
face	842	.015
turn	842	.018
ctr. drill	842	H
drill 3/8	608	H
drill 1 1/2	161	H
co-bore	842	.015
taper turn	842	.018



material:	SAE 3150	
tools:	H.S.S.	
operation	speed	feed
face	82	.013
turn	42	.020
ctr. drill	608	H
drill 3/8	608	H
drill 1 1/2	161	H
bore	315	.020
ream	60	H

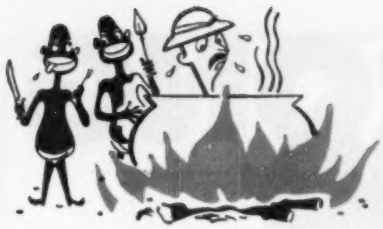
All demand a wide range of spindle speeds! And Tray-Top is the **only** economy-priced light duty lathe that gives you **twelve speeds—all geared**—in geometrical progression, 40 to 1 overall ratio. Quick, 3-lever speed selection with direct-reading "color match" dial. A choice of three speed ranges: 20 to 820, 30 to 1200, 45 to 1800 rpm . . . Totally enclosed quick change gear box . . . 48 thread and feed changes . . . flame hardened gears in headstock, change gear box and apron . . . convenient "parking space" for tools, etc.—these and many other features make Tray-Tops

OF OUTSTANDING VALUE

Write for Bulletin TEL 100-3.

CINCINNATI LATHE & TOOL CO.

Cincinnati 9, Ohio, U.S.A.



Hot Water

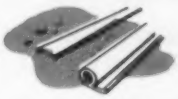
"Now our dealers want a feather-light, collapsible baby buggy,"

said the head of Tiny-Tot Transportation Co. "It's a cinch with magnesium," said his chief designer. "Magnesium frame . . . magnesium wheels . . . magnesium handle." "But we've never handled magnesium in our shop, we might get in hot water,"

said the boss. To settle the argument, they came to light-metal headquarters . . . Aluminum Company of America.

They found that handling magnesium is easy. (Industry, used about 37 million pounds of magnesium last year.) They got technical help, plus books

on fabricating and designing magnesium. Now Tiny-Tot Buggies are made of magnesium products



bought from Alcoa. Machining

costs are way down. Dealers are pushing the new lightweight buggy way ahead of competition.

These two free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, 2106K Gulf Building, Pittsburgh 19, Pa. Sales offices in principal cities.

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

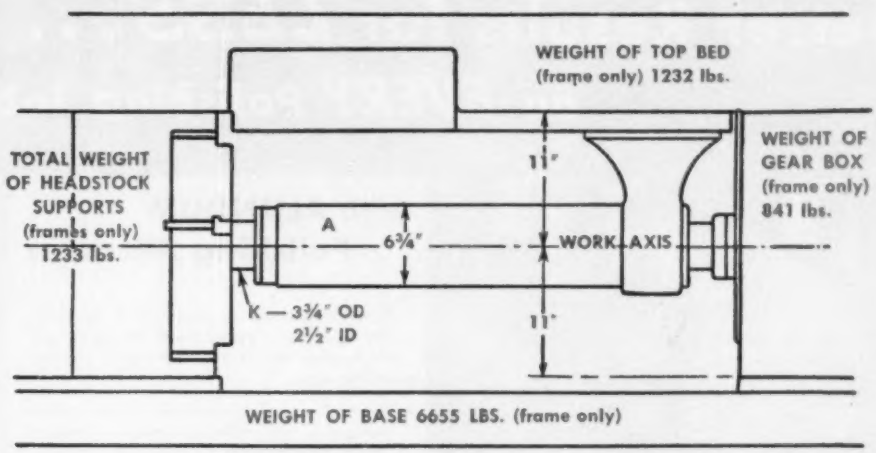
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for New S-48 Catalog just released.



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

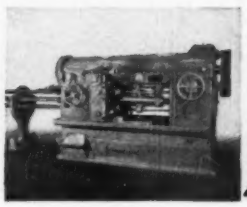
A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

The 27⅞" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.

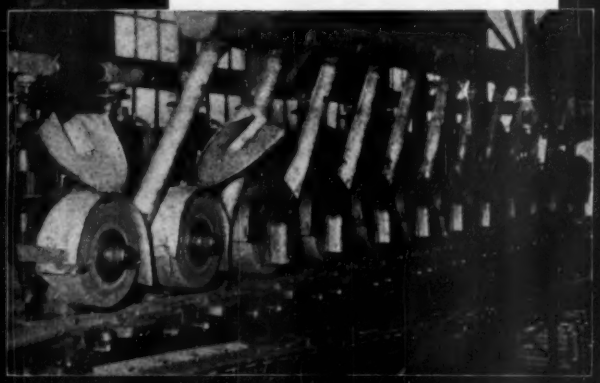


Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Better Results for *LESS* . . .
on *EVERY* Polishing Job



with ALUNDUM Polishing Abrasive

NORTON ALUNDUM Abrasive is available in the right grain sizes and with the right treatments to meet the exact requirements of every polishing job.

- For fast cut on roughing operations—where cement is the adhesive—specify S-treated ALUNDUM Abrasive
- For a general purpose abrasive for roughing or finishing where long life is of primary importance—and where the wheel is set up with cement or glue—specify B-treated ALUNDUM Abrasive
- For finishing operations, where glue is the adhesive, specify R-treated ALUNDUM Abrasive

If you are barrel-finishing metal parts, ALUNDUM Tumbling Abrasive can save you money.

- It's all abrasive for a continuous cutting action
- It's heavy for a fast, positive cut
- It's hard and tough for a long productive life

NORTON COMPANY • WORCESTER 6, MASS.

Distributors In All Principal Cities

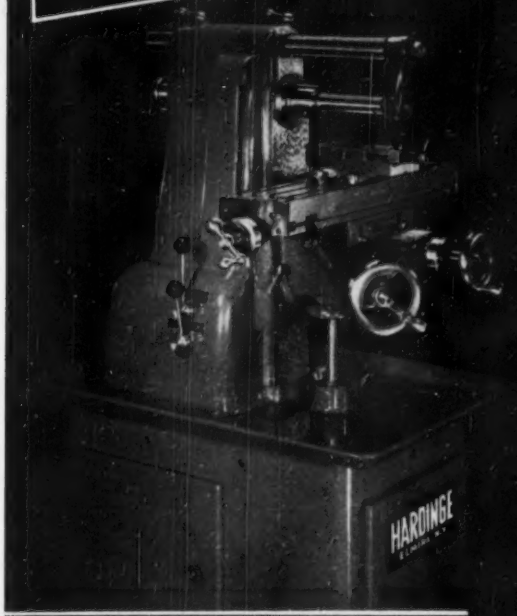
G-220

NORTON ABRASIVES

HARDINGE
ELMIRA, N.Y.

LATHE and MILLING Machines

Two Essentials for Tool Rooms



Modern high speed precision tool room work calls for companion units that are rugged, with an abundance of power over the entire speed range in order to take on all jobs to their full capacity.

Hardinge HLV Lathe and TM-UM Milling Machines, with interchangeable attachments, are the units you should specify for your tool room. These low-cost, precision machines give you important advantages:

First — Large machine capacity is freed and money saved on original machine investment. Hardinge units take over a wide variety of work that cannot be handled economically by larger, expensive machines.

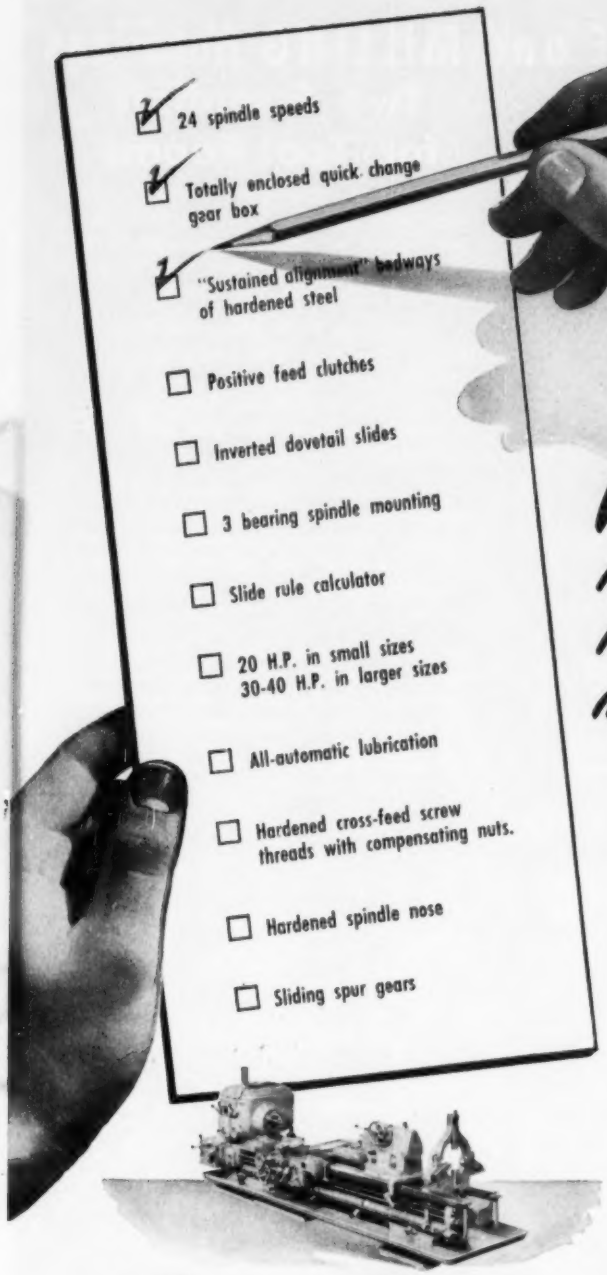
Second—Tool room costs are reduced and results improved. Hardinge units speed up operations on the smaller work and give better results in accuracy and finish.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

TM-UM MILLING MACHINE
For Complete Specifications, write for Bulletin TM-UM

HLV LATHE
For Complete Specifications write for Bulletin HLV

Offices in principal cities. Export office 269 Lafayette St., New York 12, N. Y.


24 spindle speeds
Totally enclosed quick change gear box
"Sustained alignment" bedways of hardened steel
Positive feed clutches
Inverted dovetail slides
3 bearing spindle mounting
Slide rule calculator
20 H.P. in small sizes
30-40 H.P. in larger sizes
All-automatic lubrication
Hardened cross-feed screw threads with compensating nuts.
Hardened spindle nose
Sliding spur gears

Will your new lathe have all these important features?

Use this check list to insure Profitable Performance...

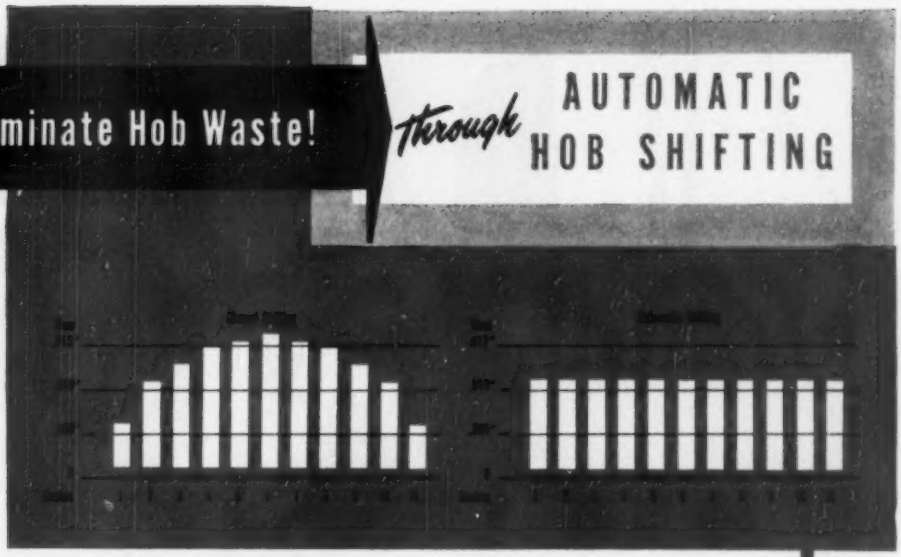
When you buy a new lathe compare all the *important* features. If any of these features are absent you're not getting all the value your money can buy. Check your old lathes, too, against these 12 necessary features. You are probably losing money if they lack any of these latest advantages.

Many of the features shown here are exclusive with Lodge & Shipley, others are not. But—no other lathe—only the Model "X" combines ALL these profit-making advancements.

For detailed information, write today for NEW "Features Catalog #200." Tells you *what* each feature is, *how* it improves or speeds operation and *why* it's important to you. Write, also, for a supply of Check Lists to make your lathe comparisons.

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Eliminate Hob Waste! *through* AUTOMATIC HOB SHIFTING



Bar charts, indicating one convolution of a single thread hob, show differences in wear between automatic and manual shifting of 1 C.P. Manual shifting of a full C.P. creates excessive wear on one portion of the hob as shown. Teeth with only slight wear (.008") sacrifice unused tooth life in sharpening .015" to recondition those with the greatest wear. Automatic shifting, through equal distribution of cutting action, wears all teeth evenly, and no life is sacrificed in sharpening. The average increase in hob life produced by automatic shifting is 50%.

The greatest advantage derived from Automatic Hob Shifting is the improved tool life afforded as wear is distributed equally over all hob teeth. Frequent shifting in small increments, provided automatically as the machine cycles, apportions the roughing action over all teeth. This distribution prevents any single tooth from breaking down rapidly, before others have contributed their share of cutting life. With equal wear on each hob tooth, no unused hob life is sacrificed in resharpening.

A common practice in manual shifting is to shift a half or full circular pitch, where a few teeth in any one setting do most of the work. The result is that the tops and flanks of these teeth "dub off". This changes the hob tooth profile. When such teeth are sharpened to restore the full cutting profile, an equal amount of stock is also removed from unused or slightly worn teeth.

Thus, Automatic Shifting eliminates unnecessary waste of tool life and tends to maintain tooth profile accuracy. Reduced machine down-time and greater output of higher quality gears are added to these benefits, making manual shifting uneconomical

These production advantages are available for most gear cutting work through Automatic Hob Shifters available on new Barber-Colman No. 8-10, 14-15 and 16-16 Hobbing Machines. Low initial investment is quickly returned in tool and production savings. See your Barber-Colman representative today for complete details.

AUTOMATIC SHIFTERS AVAILABLE ON THESE MACHINES

Extra Equipment as Indicated

No. [illegible]-15
$12[illegible].00

No. [illegible]-10
$15[illegible].00

No. [illegible]-16
$10[illegible].00

● Write for additional information concerning your work. Ask for Hobbing Notes File No. 6140.

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6140 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

This is another of the "HUNDREDS OF JOBS" which can be done on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model #8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

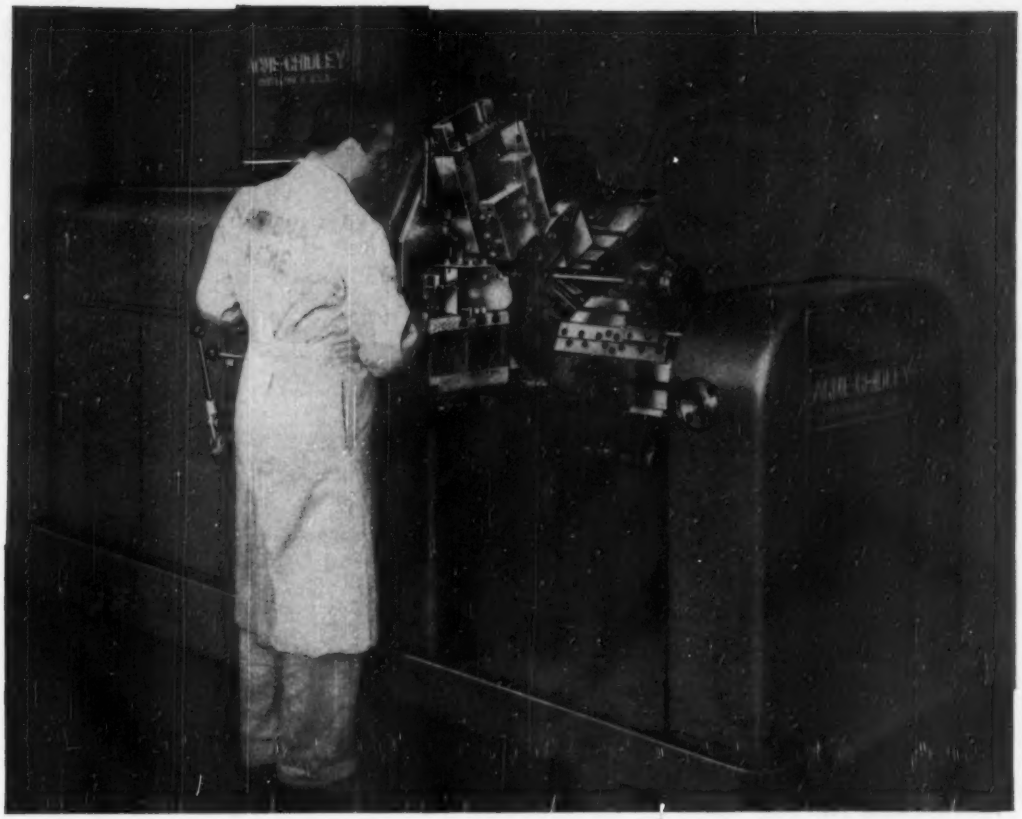
MARVEL Metal Cutting SAWS
Better Machines-Better Blades

These exclusive MARVEL Features made this job easy.

1. Large, T-slotted work table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
4. Automatic Blade tension.
5. Built-in coolant system.
6. Large capacity.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**



PRODUCTION: TEN TIMES FASTER!

Actual tests on customer jobs prove that the new Acme-Gridley Model M Single Spindle Bar Automatic turns out parts *up to ten times faster.* It's built for *production*—delivering sustained close tolerances and fine finish, at the fastest feeds and highest spindle speeds modern carbide tools can take.

Operation is completely automatic. The three cross slides and five end-turret slides are controlled independently through positive, simple camming. This provides opportunity for a wide range of time-saving combination cuts. The Model M is easy to tool, easy to operate—one man can handle several machines.

Yet this same simplicity and versatility permit the economies of automatic operation on short-run jobs, as well.

For *"more good pieces in the pan at the end of the day"*, be sure to investigate the new Acme-Gridley Model M Single Spindle Automatic. May we show you production figures on your job?

The New Acme-Gridley Model M Single Spindle Bar Automatic, built in sizes 2⅝", 3½", 4¾" and 5½", is completely illustrated and described in this new Catalog M-50. Ask for your copy.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

these heavy-duty features improve light-duty performance on . . .

Le Blond 21" Regal Lathe

LeBLOND REGAL LATHES

13"
15"
17"
19"
21"
24"

GEARED HEADSTOCK—Power is transmitted efficiently from motor to spindle at 8 conveniently-selected speeds. Gears, steel—spindle bearings, anti-friction.

QUICK-CHANGE FEED BOX—Up to 63 feeds and threads chosen simply, quickly through this fool-proof mechanism.

SEPARATE LEADSCREW AND FEED ROD—To give you long-life thread-chasing accuracy, smooth, powerful feeds.

TAPER KEY DRIVE SPINDLE NOSE—Safe, rugged and accurate positioning of chucks, faceplates and fixtures is assured by this heavy-duty feature.

ONE-PIECE APRON—Trouble-free sturdiness and protection from dirt and misalignment are built into the double-wall apron. The positive-jaw clutch means *positive* feeds.

Why can LeBlond build these heavy-duty features into Regal Lathes . . . giving you the most rugged, dependable performance in the light-lathe class?

Because only LeBlond can tap the vast engineering and production facilities of a plant building 76 lathe models. Add to this LeBlond's 63 years of leadership in machine tool design and production . . . and you have the LeBlond *combination* for top value in lathes.

Call your nearby LeBlond distributor for more information or write—

THE R. K. LEBLOND MACHINE TOOL CO.
Cincinnati 8, Ohio

Sales Offices: New York • Chicago • Detroit

NOTE: *LeBlond also builds Regals in these models: 13" Bench 17", 19", 21", 24" Gap 17/28" and 19/30" Sliding Bed Gap.*

LeBLOND Regals

World's largest builder of a complete line of lathes

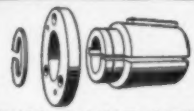
4 BIG ADVANTAGES!

ONE PIECE MOUNTING

Bushing and sheave go on together. One motion mounting. Alignment is easier. Sheave is on right first time.

POSITIVE DRIVE

Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings from bent screws.



FULL CIRCLE GRIP

Bushing split full length with separate collar. Grips shaft full length around full diameter. No forcing or distortion. Grip easily broken. No hammering.

WIDE SIZE RANGE

Magic Grip sheaves are available from 3" pitch diameter up. Style NC bushing for smaller sizes and Style C bushing for larger sizes.

MAGIC GRIP SHEAVE

YOU CAN MOUNT a *Magic Grip* sheave faster than any other sheave you can buy . . . and demount it just as fast. When you mount a *Magic Grip* sheave it runs true. It will not slip or jam. It always comes off easily.

Even if you don't change sheaves often, you should have *Magic Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off.

WIDEST V-BELT LINE

Get everything you need for your V-belt drives from one reliable source. *Texrope* offers the broadest line of V-belts, standard and variable speed sheaves and speed changers in the industry. And you also get the extra engineering skill that comes from having more industrial V-belt installations than any other manufacturer.

Get your copy of the 144 page *Texrope* Pre-Engineered Drive Manual from your A-C Authorized Dealer or Sales Office or write for Bulletin 20B6956.

A-3022

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and *Magic Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

FACTS!

THE BLANCHARD WILL ROUGH GRIND LARGE QUANTITIES OF PARTS FASTER THAN OTHER MACHINES *and* **THE BLANCHARD WILL PRODUCE SURFACE FINISHES AS FINE AS ALLOWED BY THE PHYSICALS OF THE METAL ITSELF**

ROUGH GRINDING possibilities with a Blanchard is illustrated by these refrigerator valve plates. 1/16" of stock is removed from both sides of the rough cast iron parts. 44 pieces are ground per load at a rate of 80 pieces per hour (160 surfaces), to limits of ±.002" for size. A No. 18 Blanchard with a Blanchard 30C40 wheel is used.

FINISH GRINDING these valve plates is done on the same Grinder. With 44 pieces on the chuck, a rate of 100 pieces per hour (200 surfaces) is obtained. .003" of stock is removed from each side to limits of ±.002" for size. Surface finish produced on the cast iron is *6 micro inches or better!* A Blanchard 100C15 wheel is used.

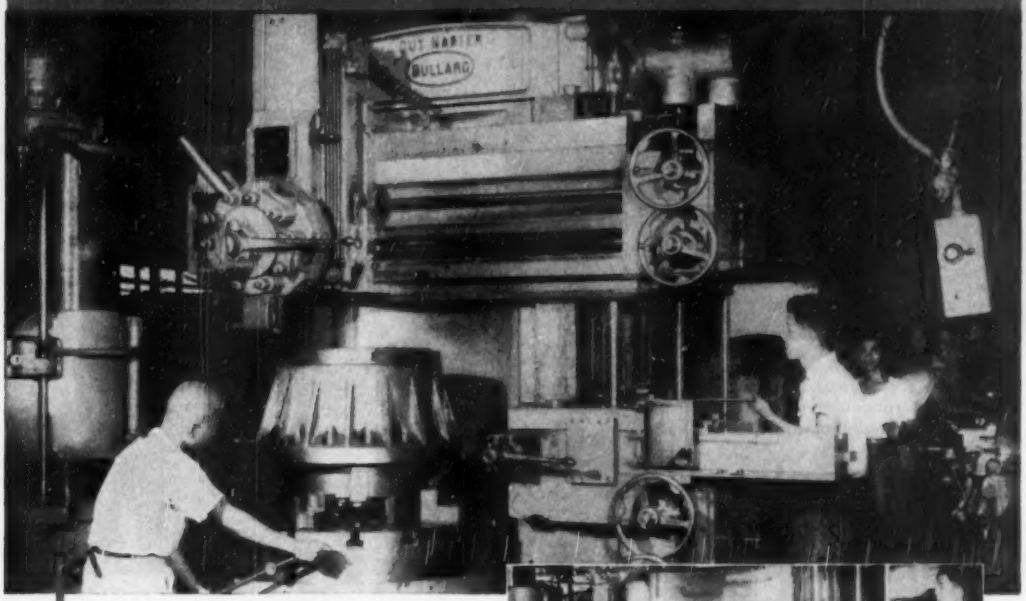
Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

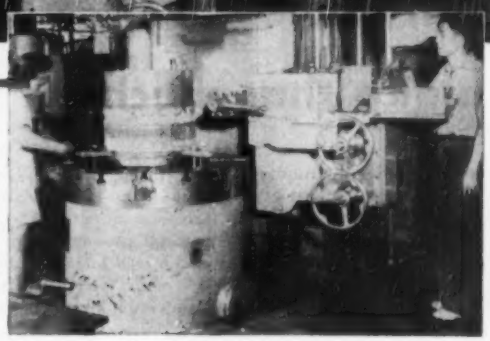
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

TANDJONG, PRIOK

. . . . INDONESIA





FAR, FAR AWAY!

in the shops of the Royal Packet Navigation Company shipyard, Tandjong, Priok, a Bullard 42-inch Cut Master Vertical Turret Lathe has found its place.

Reliability, Simplicity of operation and Performance account for many foreign installations.

We proudly mention a 64-inch Cut Master equally far away in the Oil Fields of Sauda, Arabia.

Selection of these machines for such far away places bespeaks Confidence in BULLARD Equipment and Service.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

49½% RETURN!

Where else can you make that much on your investment?

Replacement of antiquated metal-turning machines is one of the most profitable investments you can make—and here's proof:

One of our customers has furnished us with a detailed report of the direct labor savings made by the installation of a modern Monarch tracer-controlled lathe. This report shows *a total saving in labor charges alone for the first year, amounting to 49½% of the purchase price of the lathe.* This figure covers a wide diversity of production jobs, with lot sizes ranging from as small as 3 units up to 2,600.

But that's not all—the report has no way of showing the savings made by eliminating the cost of form tools. Nor does it show the economies that result from reducing subsequent grinding operations and from reducing spoilage—both due to the greater accuracy this new turning method makes possible.

This documented case study from our files is by no means extraordinary. Literally hundreds of our customers have found that obsolete metal turning methods can be converted into "*peak production at a profit*" through the purchase of a modern Monarch lathe. May we show you how it can be done in your shop?

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO.
Sidney · Ohio

FOR A GOOD TURN *FASTER* — TURN TO MONARCH

LEADING MANUFACTURERS* SPECIFY

DANLY PRESSES

...the key to stamping economy!

On mass-production lines and under exacting precision stamping requirements, Danly presses are establishing new performance records. Outstanding improvements in press engineering, design and construction assure longer uninterrupted production runs, increased die life and greater operating safety.

The new Danly clutch alone, designed to combat heat, major cause of press clutch wear, is proof of Danly press engineering leadership. Other outstanding features include complete pressure lubrication and a specially designed press control system. Write today for specific information on the advantages of Danly Presses in *your* plant.

Send for this new Danly Straight Side Press Catalog

*The 175 ton straight side DANLY press shown is located in the new A. B. Dick plant, manufacturers of mimeograph office equipment.

MECHANICAL PRESSES . . . 50 TO 3,000 TONS

DANLY MACHINE SPECIALTIES, INC. DANLY® 2100 SOUTH LARAMIE AVENUE, CHICAGO 50, ILLINOIS

FRACTIONAL GRADES enable you to choose the exact degree of hardness desired by splitting every normal grade into three degrees of hardness, where a whole grade change would be too great.

. . . and all manufactured in FRACTIONAL GRADES. This outstanding and exclusive Bay State development eliminates using segments that are "close enough" for hardness grade. FRACTIONAL GRADES permit a precise selection of grade for the work intended.

ADVANTAGES: Increased Production . . . Faster Stock Removal . . . Sharper, Cooler Cutting . . . Better Finish . . . Closer Tolerance . . . Lower Power Consumption.

BAY STATE'S other abrasive products for surfacing jobs are also available in FRACTIONAL GRADES.

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.
Chicago, Cleveland, Detroit, Pittsburgh.

BAY STATE®

To Bay State Abrasive Products Co., Dept. IW, Westboro, Mass.

We are interested to be shown how Fractional Grades can be applied to our grinding requirements. It is understood that we assume no obligation.

☐ Please send your abrasive engineer. ☐ Please send descriptive literature.

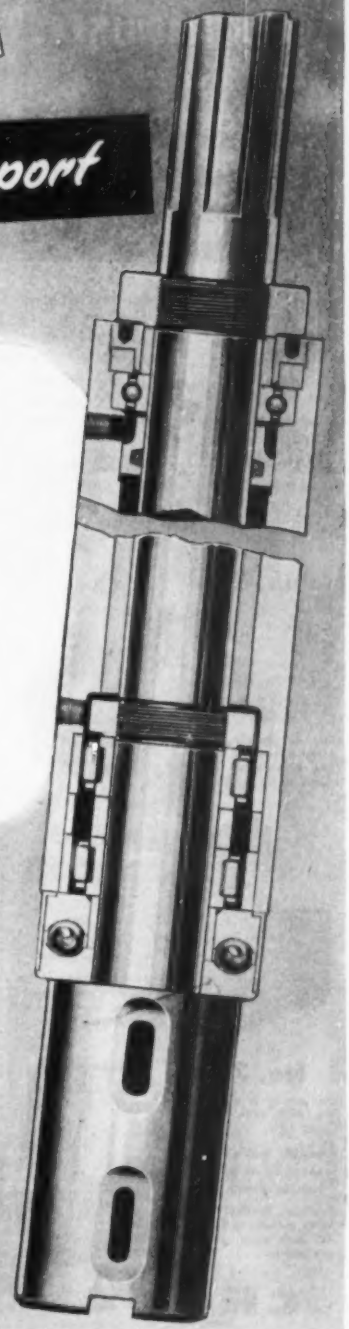
Company _____

Street _____

City and State _____

Name _____ Position _____

Unusual Tool Capacity
Unusual Spindle Support

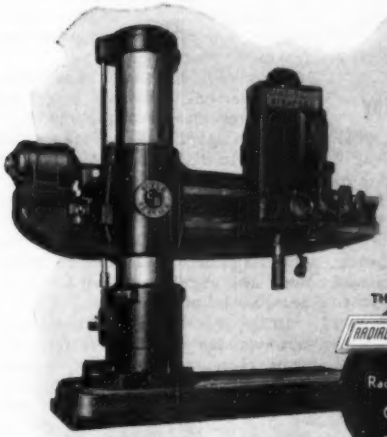


What is full spindle support? What does it accomplish? It's rigid support against thrust and radial load—at ALL positions of the spindle.

In performance, it means accurate, smooth power delivery and long, trouble-free operation.

The multiple spline driven Cincinnati Bickford Super Service Spindle—with its large thrust bearing and its special sliding sleeve—never feeds away from its bearings.

This modern, up-to-date design, with 36 speeds and 18 feeds, also gives a maximum tool capacity for any given size.



Write for Circular R-29 for details of construction of this Cincinnati Bickford Super Service Radial Drill.

This machine is furnished in sizes 11" to 19" diameter column, 3' to 8' arm.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

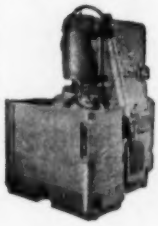
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

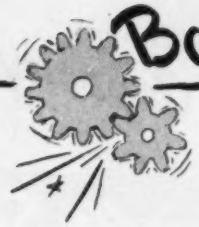
Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

THE CROSS COMPANY
Established 1890

SPECIAL MACHINE TOOLS
MILLING · DRILLING · TAPPING · BORING
TURNING · SHAPING · GRINDING · HONING

DETROIT 7, MICHIGAN

Backlash



Wrench Pointers

Your excellent report "Know Your Hand Tools" in the May 29 *AM* has put me on a spot. Watching a man curse as he tried to tighten a square adjusting screw, I commented that he ought to get himself an 8-point box wrench. "They don't make 'em," said he. "Yes," said I. "Prove it," said he.

And here's the rub! I can't. I've referred to the catalogs on file, and no mention is made of 8-point box wrenches. Eight-point sockets and 4-point box wrenches, but no 8-pointers.

Ralph Thompson
Cleveland

P. S. I think they make them, too.

Sorry, but it seems we were wrong. We have checked with several manufacturers who state that such tools are not standard. We did come across an 8-pointer made specifically for adjusting the brakes on a Model A Ford — but that doesn't count.

There Is One Best Way

John R. Godfrey (*AM*, May 1, 1950) asks, "Is there a one best way?" The short answer to that is: Yes, there must be a way of doing a particular task better than any other, but—. Who is to define and decide which out of several lines of procedure is the best from all points of view? In machine shops of 50 years ago, every turner used to think and say that the tools he ground for himself were the acme of perfection. I have had some of the old stagers say to me, "Nobody could grind my tools for me, Jim, like I do 'em myself." But along came F. W. Taylor and defined which shape was best for the maximum removal of metal and performance between the grinds. His opinion was taken and all tools were ground on a Gisholt machine in the toolroom.

I was with a large firm in London in the first decade of this century, where this system was in vogue, and many times I have had to argue the pros and cons with nearly all the old timers. They thought that it was a loss of dignity to have someone tell them what to do and how to do it. Nevertheless, the Taylor-White system is now accepted by all.

J. P. Essex
Hove, England

Friction Sawing Vs Hot Spot

In your article "Are We Riding the Brakes in Machining Speeds?" (*AM*, August 7), you raise the question about the possible relationship between hot-spot machining, friction sawing, and high-speed milling. The power required to remove metal is used up in two ways: (1) in deforming the metal and (2) in overcoming friction between chip and tool. In the case of hot-spot machining and friction sawing, heat is used to soften the metal and reduce its strength so that much less power is required to deform it, thus reducing the over-all power requirement for metal removal.

In the case of hot-spot machining, this statement is directly borne out by actual measurements made in our own laboratory on the power used up in deforming the metal and in overcoming friction between the chip and tool, when machining at various temperatures from room temperature up to 1500 F. Only the power required to deform the metal decreases significantly as the temperature is raised.

In the case of high-speed milling, however, the action is not quite the same. Measurements which we have made at cutting speeds up to 1500 fpm show that both the power used up in deforming the metal and in overcoming rubbing friction between the chip and tool decline slightly as speed is increased, but both in about the same proportion. This slight decline can be attributed mainly to the higher temperatures accompanying the higher cutting

A toolroom baby that's grown into a-

Production Giant!

Rivett 918 "Steelway" Turret Lathe

Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

For here's a lathe that's been developed out of the bench class into a production machine. It has all the inherent precision for which Rivett has long been famous, plus time-saving features that reduce set-up and cutting operations to a fraction of that normally required. Single part production can be powered and cycled automatically.

Any one of 120 to 3750 RPM cutting speeds may be instantly and accurately selected; newly designed collets increase speed of operation as well as accuracy and gripping power; automatic chuck closer and well grouped controls step up operator time.

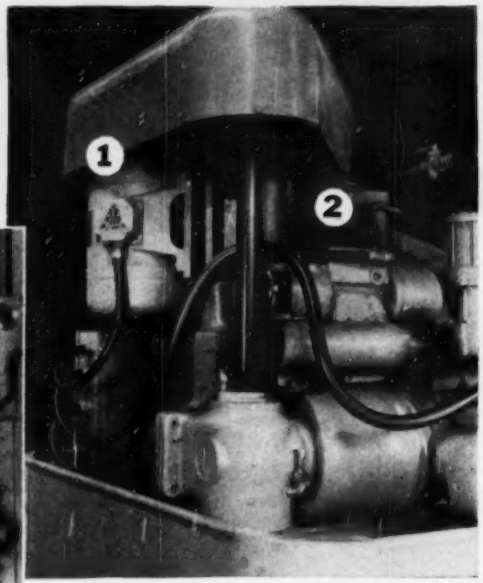
Bulletin 918ST will give you all the details. Write for your copy today.

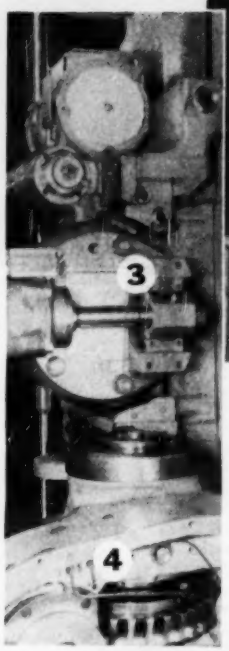
RIVETT **LATHE & GRINDER, Inc.**

Dept. AM810, Brighton 35, Boston, Massachusetts

For Finer Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master's Master Tools

for LEADERSHIP in SINGLE SPINDLE HOBBERS too LOOK to LEES-BRADNER!





A REAL "Leader" ON EVERY COUNT!

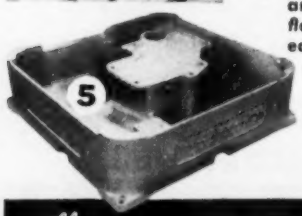
1 - Motor on top for easy accessibility.

2 - Extra capacity reservoir oils slides, ways and the lead screw.

3 - Hardened and ground guides for the new Timken precision bearing outer support.

4 - Built-in circulating system lubricates the headstock.

5 - New pan . . real deep for plenty of coolant . . even less floor space . . chips flow toward trap door for speedy, easy removal.



Why not contact your Lees-Bradner representative?

Request Bulletin A-59s

The LEES-BRADNER Company
CLEVELAND 11, OHIO U S A

speeds. However, the decline is only on the order of 2% per 100 fpm increase in cutting speed. Thus, in the range of normal practice (200 fpm to 1500 fpm), this decline amounts to considerably less than the 50 — 75% decrease in power requirements brought about by use of hot-spot machining methods.

M. Eugene Merchant
Senior Research Physicist
The Cincinnati Milling Machine Co.

Missing Persons

Could you help me in the location of a machine-tool firm which went out of business about a year ago? I require a part for a machine built by Canedy-Otto Manufacturing Company, Chicago Heights, Ill. It has occurred to me that some other organization may have purchased its stock and assets; may also be able to supply the part desired.

Martin B. Retting
West Hurley, N. Y.

. . . Canedy-Otto Manufacturing Company was purchased by Cincinnati Lathe and Tool Company, Oakley, Cincinnati 9, Ohio, a subsidiary of Cincinnati Milling Machine Company.

Practical-Idea Cutouts

I have been reading *American Machinist* for about four years, and I have saved the Practical Ideas pages in a loose-leaf notebook. I, for one, would like to see these pages inserted in your magazine so they could be removed and punched.

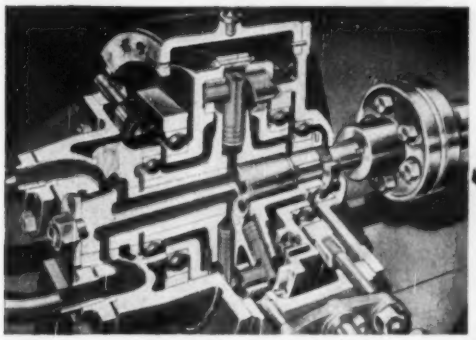
When we need some idea in our shop that I remember seeing in the magazine, I can go back and look it up and bring it into work. The loose-leaf notebook makes it easy to remove and replace pages.

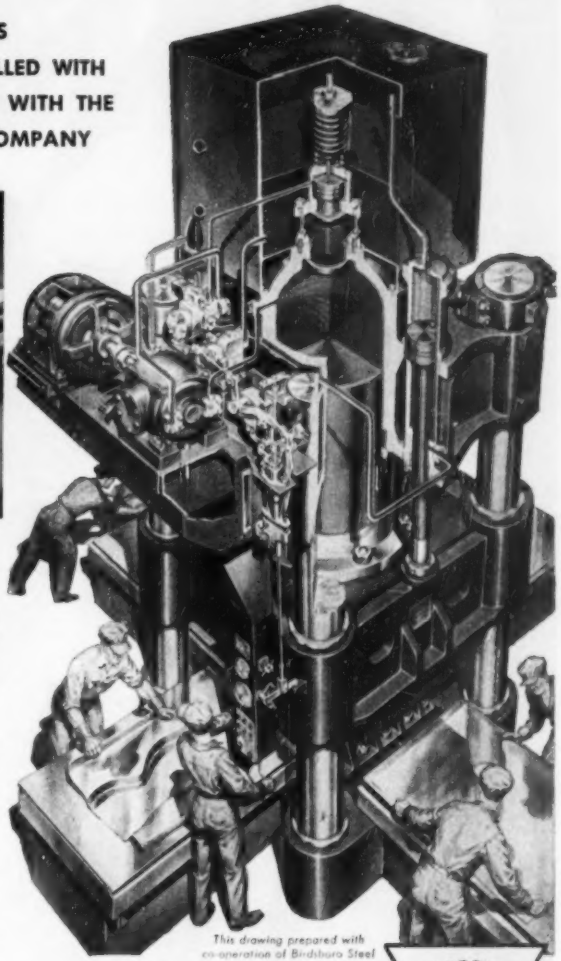
Orville O. Kilbourn
Montebello, Calif.

This idea has been suggested a number of times, but postal regulations prevent our advising readers to do this. There is nothing to stop interested readers from following Mr. Kilbourn's suggestion on their own initiative, even though we do not indicate cut lines and hole-punch positions.—Ed.

First Choice for Hydraulic Machines!

MORE HYDRAULIC SYSTEMS IN INDUSTRIAL MACHINERY ARE FILLED WITH SOCONY-VACUUM PRODUCTS THAN WITH THE PRODUCTS OF ANY OTHER OIL COMPANY





This drawing prepared with co-operation of Birdsboro Steel Foundry & Machine Co.

HERE'S WHY...

Famous Gargoyle hydraulic fluids have clearly demonstrated their ability, in thousands of machines, to assure smoother, more continuous operation, extend periods between drains, reduce maintenance time and expense.

They are approved by major builders of hydraulic mechanisms, and are backed by the world's greatest lubrication knowledge and engineering service. Gargoyle hydraulic fluids are constantly being improved by Socony-Vacuum creative research.

Enjoy the cost-saving benefits of Correct Lubrication. Call in Socony-Vacuum today!

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

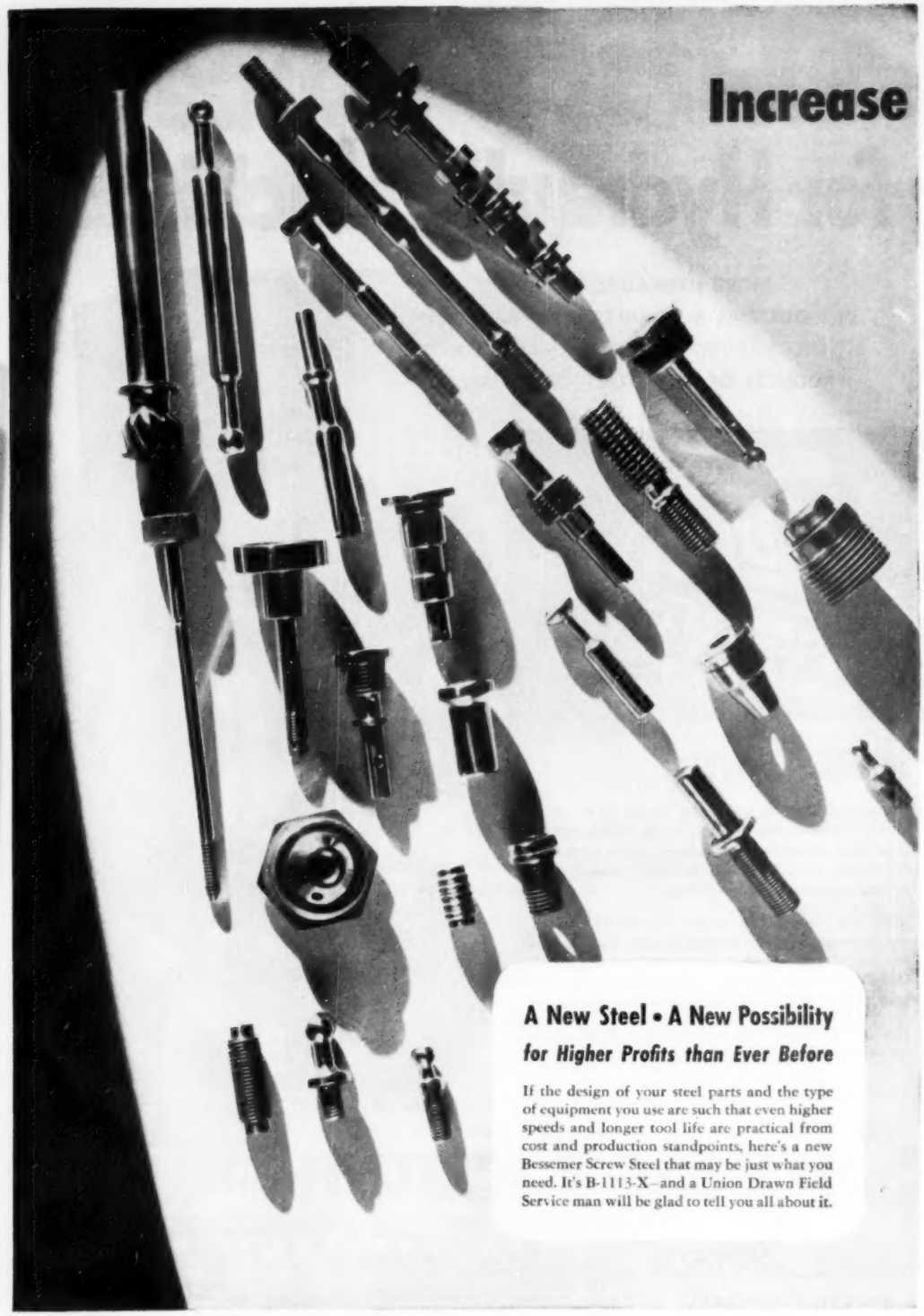
Socony-Vacuum

Correct Lubrication

GARGOYLE Lubricants

SOCONY-VACUUM

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE



A New Steel • A New Possibility

for Higher Profits than Ever Before

If the design of your steel parts and the type of equipment you use are such that even higher speeds and longer tool life are practical from cost and production standpoints, here's a new Bessemer Screw Steel that may be just what you need. It's B-1113-X—and a Union Drawn Field Service man will be glad to tell you all about it.

your spread between profit and loss

through this improved

MACHINABILITY

● Even though overhead, material and other operating costs are fixed, there still is one way to cut unit costs in the mass production of duplicate steel parts. There still is one way to increase your spread between profit and loss. It's through better MACHINABILITY in the steel bars you use.

That's the first reason why you should specify Republic Union Cold Drawn Steel Bars for every application involving machining.

For more than 60 years, better MACHINABILITY has been the primary objective of Union Drawn metallurgists and engineers. They've spent long hours in laboratories ferreting out the "whys" and "hows" of machining operations. They've visited customers' plants and worked beside the men who set up and run the "automatics." They've cut up tons of standard and experimental analyses on the latest type "automatics" in Union Drawn plants.

Time after time, the experience thus gained has been passed on to customers through a continuous improvement in Republic Union Cold Drawn Steels—carbon, alloy and stainless. Speeds and feeds have been stepped up. Cutting performance has become uniform bar after bar—shipment after shipment. Abrasive elements have disappeared. Tool life has been lengthened. Machined surfaces are brighter, smoother. Production efficiency has climbed. Output has increased. Unit production costs have dropped to new low levels.

Reason No. 2 is this: These same experienced metallurgists and engineers are ready NOW to help you obtain profit-making results by working with your engineers and operators right in your own plant.

Want to increase your spread between profit and loss on steel parts production? Call your nearest Republic District Sales Office or write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic

REPUBLIC STEEL ®

US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

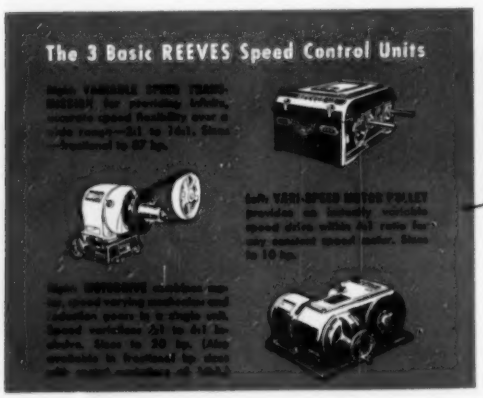
Example: Close Control of Conveyor Speeds

If you have a wrinkle in your flow of production, *smooth it out* by applying REEVES Speed Control to the conveyors in your plant.

With accurate, positive REEVES on the job, conveyor speeds are instantly adjustable, within a fraction of an inch per minute, to the *exact* speed desired. Speed changes are made while the conveyor is in operation, without stops for costly belt or pulley changes. A mere turn of a handwheel or touch of a button delivers the right speed for every operation and every operator under every changing condition . . . prevents delays, lost motion, congestion or idleness caused by over-supply at certain points and under-supply at other points.

To assure you of the unit best suited to your particular operations, REEVES makes a complete line of variable speed drives, built around the three basic units shown below. Each is available in a wide range of sizes, designs, capacities, speed ratios, and with your choice of manual, push button or completely automatic controls.

REEVES units have been proved in 265,000 installations in virtually every industry—are standard equipment on more than 2,100 different makes of machines. Apply REEVES Speed Control to the machines you now use—always specify REEVES for the new machines you buy. Write today for *all* the details. Ask for new, 132-page Catalog A-50-3N.



This motor assembly conveyor, installed in one of the nation's large automobile manufacturing plants, is standardly equipped with a REEVES Motor Pulley by the maker, General Conveyors Corporation, Van Dyke, Mich. The instant, accurate speed variations available with REEVES compensate for differences in number and skills of operators on the assembly line; also compensate for variations in delivery of assembly parts at different stations along the line.

This is one more example, taken from many on file, showing how REEVES Speed Control regulates conveyor speeds—boosts production ceilings. For other cost-cutting functions performed by REEVES, see the listing below.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

accurate • variable
REEVES *Speed Control*

Other Uses:

Handle more shapes, sizes and materials • Match skills of operators • Compensate for changes in character of product in process • Maintain uniform peripheral speeds • Maintain uniform pressure, temperature, liquid level, etc. • Assure accurate timing • Synchronize parts of one machine or different machines operating in series.

SPOT NEWS of Metalworking

- **Moscow is known to have offered Russian-built machine tools** to Swedish metalworking companies. This is believed to be the first time that the Soviet has attempted to compete in the machine tool export market. No reliable facts have come to light as to the size of Russia's machine tool industry.

- **A preference rating will be given shortly to all defense orders** for machine tools and other production equipment. No attempt will be made to give priority to one defense order as against another. All civilian-goods business simply will be unrated. National Production Authority will write and issue the preference rating plan. For details, see p130.

Preliminary estimate of critical materials—steel, copper, etc.—needed for war production during 1951 is to be supplied by armed services to NPA by September 28. Final estimate, except for aluminum, is reported due on November 1. Not until then will accurate data be at hand as to steel tonnage required next year.

- **Symptoms of tightening labor market:** "quit" rate has risen five months in a row. Fewer workers are being laid off. Layoffs are lowest in four years. More workers are quitting jobs to take better ones.

- **Newest control on exports of machinery to Europe** stipulates that no license is to be issued for U.S. machines to be shipped abroad if end product for which it is used is to be sent behind the Iron Curtain.

- **New forging process which eliminates much riveting in manufacture of airplane wing panels** has been developed by Lockheed, Wyman-Gordon and Air Materiel Command's Industrial Planning Division. Process uses specially-designed dies and a vertical hydraulic press to forge 1/8-in. thick integrally-stiffened wing skins, doing away with riveting of reinforcements. Chip loss of aluminum is under one-half of one percent. Previously, when machined from solid stock, conversion loss of aluminum in chips ran as high as 80%.

- **Twenty trucks a day will be assembled** eventually at $2¼-million International Harvester plant at Dandenong, Victoria, Australia. IHC already has completed plans to build up to 10 trucks a day from components furnished by IHC tractor factory and by Australian subcontractors.

Combination jet and propeller aircraft engine has been acquired by General Electric through purchase of patents, name and technical data of Turbodyne Corp., Hawthorne, Calif., research subsidiary of Northrop Aircraft, Inc. GE will test and evaluate several engines built by Turbodyne under sponsorship of armed services.

- **Preference rating to be given government defense contracts** will enable contractors to get priority in obtaining raw materials. Materials remaining for civilian use will be put on voluntary allocation basis, customers getting what is left after government contracts are cared for.

- **Steel companies in Detroit are getting as many as 450 car loads of steel scrap** from automobile companies each month. This is choice scrap which the big steel companies would like to get.

- **Ford and General Motors are trying out screw machines equipped with induction hardening** and quenching equipment on the tool slides.

- **Cleveland's new tank plant—the old bomber plant—is to become a permanent Army Ordnance** center. It will be retained intact, after present needs are filled, to enable it to swing into action at any time. Necessity for this was shown when government reserve machine tools tagged for equipping the plant were found to be almost wholly inadequate due to obsolescence, state of disrepair, parts missing, etc.

Above: Counterboring a hole in a cast iron machine base. Uniformity of chips indicates free-cutting action; chip disposal is aided by wide flutes. And when the operation is finished the cutter is removed from the holder with a simple *twist of the wrist.*

There's no wedging action in Continental Standard Drive Counterbores. Cutters are removable from the holder with a simple *twist of the wrist,* even after the toughest cuts. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive that practically is indestructible. Double bearing areas in the drive assure rigidity and proper alignment of cutters and holders. Continental Counterbores are available individually or in sets that include holders, cutters, countersinks and pilots in practical size ranges.

The new Continental Catalog lists various counterbore holders and cutters (in high speed steel and carbide tipped). For your free copy, write on your company letterhead. Please ask for Catalog No. 60681.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

Washington

There's talk of no excess profit tax—even when the "second-round" tax increase bill is written, next year sometime. Some of the experts don't figure it as an answer to the present problem. Here's why:

An excess profits tax is a temporary expedient; it won't work so well over the 10 years or so over which defense spending is expected to stay high.

And, it didn't raise very much money in World War II.

But don't get excited. It's only talk. Politics will force Congress to include some kind of profit-limiting device in any tax bill written next year.

• • •

Some $50 billion a year for defense is the figure now being talked among top-level Washington planners as the long term year-to-year cost of keeping our defenses up.

That figure includes the costs of arms aid; maintaining larger numbers of troops the world over; an on-hand supply of equipment for combat replacements to back up other "Koreas"; as well as the standard expenses of mobilization.

The cost this year—fiscal 1951—won't quite hit the long term rate. Industry couldn't absorb it that rapidly. But Congress will be asked to appropriate more than $40 billion all-told for military necessities this year. Some $30 billion has already been asked for.

Next big jump will come later this fall or winter, when Truman asks for another $6 to $15 billion for defense.

The exact figure hasn't actually been set yet. It depends to a large extent on how successful General MacArthur's bid for a quick end to Korean fighting is. It also depends on how much prices continue to rise between now and then.

• • •

A brighter future for American shipbuilding and the Merchant Marine generally is one thing sure to result from mobilization.

Decision to launch the super liner SS United States as a super troop-carrier emphasizes the nation's critical shortage of high-speed passenger liners.

Another plan now taking shape calls for the construction of 200 attack transports (12,000 deadweight tons)—50 to be started in the near future.

Even the Gordon Gray report on U. S. foreign economic aid is supposed to speak favorably of the U.S. Merchant Marine. An earlier draft recommended its dissolution. Reason for the change: industry had a hand in shaping its newer policies.

Labor's influence on the administration was clear when Truman forced Robert N. Denham to resign as chief Taft-Hartley prosecutor in the National Labor Relations Board.

Denham's successor will go easier on unions, particularly in getting injunctions against secondary boycotts. He will work closer with the five-man board in declining to apply the labor law in disputes affecting small business.

• • •

Taft-Hartley is secure, but not Taft. That's the outlook in next month's elections. Labor figures it must pick up five votes in Senate, 14 in House to repeal the labor law. It won't. Fact is, it will probably lose ground, four votes already being lost with defeat of four senators in primaries.

Sen. Taft is in danger of defeat, but he'll squeak through. He lost votes by attacking Acheson and opposing Gen. Marshall as Secretary of Defense. Heavy administration and labor attack in Ohio may boomerang.

• • •

There are now five reasons Washington has for wanting greater control over U. S. export trade. In addition to pre-Korean efforts to prevent critical supplies from reaching Iron Curtain countries, the bureaucrats are working out export control plans to:

Limit sales abroad of goods in short supply here.

Direct necessary supplies to foreign strategic material development programs.

Assure the continuity of western European recovery and Point-4 world development activities.

See that exports of specific commodities are reduced in proportion to domestic production cuts.

• • •

What Washington is doing to ease the manpower pinch:

Military is asking contractors to hire through federal-state Public Employment Offices.

Public Employment Office will give preference to war contractors in referring job applicants to a job.

National Production Authority has set up an Office of Labor Production and Office of Manpower Requirements.

Office of Labor Production will encourage labor-management committees in war plants to boost productivity, thus reducing labor needs. Office of Manpower Requirements will work with materials allocations authorities to try to coordinate materials and manpower.

Selective Service will be asked to use list of essential activities and critical jobs as guide in deferments. So far it's being used only in delaying temporarily Reservists and Guardsmen.

FOR A **FUNCTIONAL** SURFACE FINISH

MICROHONE[b.] *

20[a.] √ [c.]

a. **CONTROLLED SURFACE ROUGHNESS**
Any desired surface roughness duplicated in every part

b. **NO WAVINESS OR SURFACE IRREGULARITIES**
A true geometrically-accurate surface with no high spots to break the lubricating film and cause high localized heat

c. **A CLEAN-CUT CROSS-HATCH PATTERN (LAY)**
The cross-hatch pattern characteristics of the MICROHONING process is unlike that of any other machining operation. It is free of fragmented, torn or smear metal that will wear or flake off under load.

* SURFACE-FINISH SYMBOLS recommended by SAE Surface Finish Committee and its sponsor the American Standards Association.

Cross Hatch

Cross Hatch

MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

Detroit

Business continues to roll along in the machinery shops of the Detroit area. Latest prod: The long-awaited Buick engine program. The first placements are now coming out; more will appear later. Presumably it will be a high-compression job, a la Olds and Cadillac. It's tagged for 1952 models, maybe 53's. There's some Chevrolet, Cadillac and Ford work out, too.

• • •

Looking ahead, the optimists can sight a big Ford program for aircraft engines; the company will build them for the Air Force in the erstwhile Dodge-Chicago plant, more recently the site of the ill-fated Tucker venture. At this point the program is a pilot one—a very minimum of machines, even though that adds up to plenty. With award of this job to Ford the indication lessened that Buick would get a parallel assignment; both Ford and Buick did phase one work on the program, but on today's size of things, there is not enough production programing for both companies to tool up.

• • •

Prices are going up, and purchasers are buying farther ahead. As of August—most recent report—73% of Detroit buying was being done on three-month and farther forward basis. In July that proportion was 54%—apt indication of the sudden change in outlook.

That price movement worries machine tool companies. If they quote on a large job today, they fear costs by delivery time may be far away from current estimates. What to do? Some are pondering escalator clauses of some sort; others are screening orders, taking only those where buyers will be reasonable if manufacturing costs go out of line between now and delivery.

What's tight in materials? Here are the problems that face the automobile makers today—

Steel — Sheets are in short supply. On paper there won't be much more of a pinch six months from now than today, despite mounting military needs. In fact, though, there may be allocations of some sort which would cut into auto output, for morale reasons.

Copper — Mills went on 5-day weeks to conserve the supply, and auto companies are being pinched. If this keeps on copper may be the primary problem in the months ahead, the determinant of production speed.

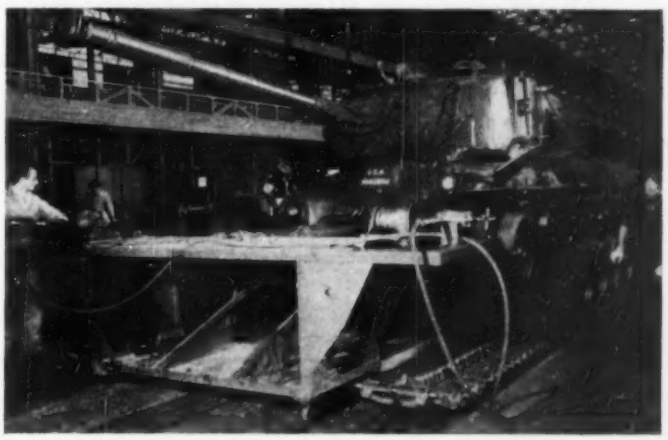
Lead — Not at all plentiful, and potentially quite tight. It goes into batteries and body solder, the latter used liberally on more expensive car bodies. If it gets worse it, too, may be a determinant of production volume.

Chrome — Definitely tight, but enough to get along on today. If it keeps getting tighter, there'll be thinner (if possible) plating over steel, no plating at all over stainless, elimination of some of the bright decoration now on cars.

Aluminum — Tight today, to the extent that random parts which were made of that metal to reduce weight may soon be switched back to steel.

• • •

The 1951 Nash cars, shown late in September, offer Hydra-Matic on both the Ambassador and Statesman lines; last year Hydra-Matic was available only on Ambassador. More low price Rambler models will be introduced later on. The Nash problem, as elsewhere, is steel: Only about half the complete line is in production today; the other half is tooled but there aren't materials enough to release the job for production.



TANK PRODUCTION is well under way at Army's Detroit Arsenal. Photo shows workers pulling on the tread on a General Patton M-46 tank. Detroit manufacturers expect more tank work in the near future on new designs which are ready to go but are not yet assigned or released

a set of Webber MASTER BLOCKS . . . .

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When differences arise over the acceptance of a critical measurement there is nothing like the assurance that comes from possession of a set of master blocks. They banish the uncertainty and anxiety over possible disappointments or dispute with customers.

Naturally you'll want blocks with unusual accuracy like Webbers. All inspection of Webber blocks are made with instruments so sensitive that a microscopic scratch develops into marked deflection on the electronic analyser. The instruments used for checking size in a similar manner respond violently to differences in millions of an inch.

That is why Webber blocks amaze even veteran gage makers when they discover accuracy to be well within a fraction of the allowable tolerance.

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Errors from worn blocks can be deceptive!

"I like to sleep well at night, so I avoid doubt and carelessness during the day. For instance a worn block that is ¼ of a 10th undersize may seem accurate enough for inspection yet when this block with its small error is combined with similar blocks they add up to a major error when the tool reaches the point of assembly. I use a set of Webber Master Blocks for measurement in split tenths. It's a sure way to avoid trouble before it occurs."

INDIVIDUAL CARBLOX NOW COST LESS

A growing volume of carbide replacement business has enabled Webber to effect economies in production of individual blocks which are being passed on to the user. If you do not have the new price supplement on Carblox, write for your copy. Note: This new price reduction does not apply to the complete set—only to individual carbide blocks.

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LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

New Tooling

New tax bill just passed is expected to give a big impetus to purchase of new machine tools and other production equipment to fill defense contracts. It permits write-off of such purchases in five years. Same kind of rule prevailed during World War II.

• • •

New machine tool orders stayed close to the August postwar peak during first half of September. Generous share of business is coming from smaller customers.

Machine tool orders rose sharply in August, as predicted on this page two weeks ago. The index of National Machine Tool Builders' Association stood at 307.3 in August, a height not reached since war days. That is six times the volume in the same month of 1949.

Bookings of machine tools lately have been at a rate of $1 billion a year, a figure attained only once before in the history of the industry—in the early years of World War II. Surprisingly, most of the business is not for war-production purposes.

Shipments of machine tools are rising. They were at 93.7 in August, compared with 68.3 for July. Builders are expanding work forces as rapidly as possible, and are adding shifts. But they are handicapped by shortages of skilled men.

Defense orders for machine tools probably will carry a preference rating by the time you read this page. NPA has been writing a simple priority plan, which merely rates a defense contract and does not rate civilian work.

This preference rating is first step in direction of possible application of E-1-B some day. But there is no thought of putting E-1-B into force in foreseeable future.

• • •

Doing machine tool business in Europe is getting harder all the time. Newest obstacle is ruling that export license controls hereafter will be entirely within discretion of Department of Commerce licensing officer. Inter-departmental committee no longer will have any authority.

• • •

U. S. machine tools ordered for Swiss firm making locomotives cannot be shipped to customer because some of the company's locomotives are to go to Soviet satellite countries or to Russia itself.

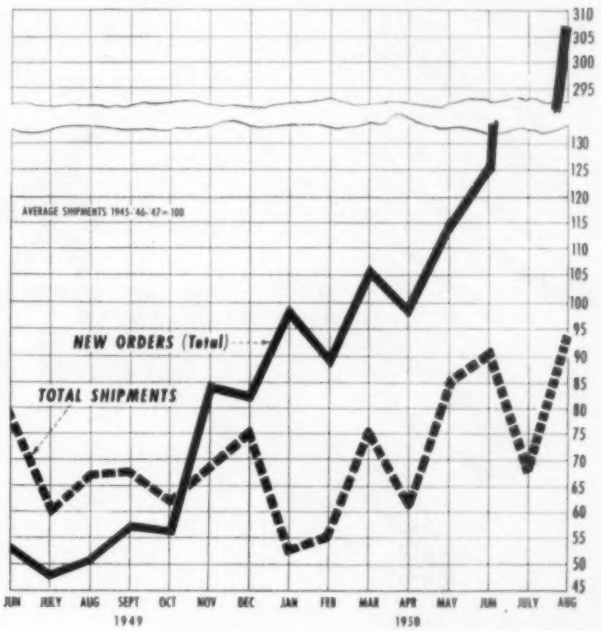
• • •

Large used machine tool dealer in midwest hasn't had a machine on his floor for seven weeks. He is importing about a dozen English equivalents of Brown & Sharpe screw machines, all of which have been sold before arrival.

AUGUST MACHINE TOOL ORDERS ESTABLISH POSTWAR RECORD

	New Orders (Total)	Foreign Orders (Included in Total)	Shipments (Total)
1948			
Jan.	83.1	14.0	75.3
Feb.	77.3	12.7	87.1
Mar.	86.3	16.1	83.6
Apr.	86.3	14.1	82.0
May	73.5	11.4	82.6
June	83.4	11.9	94.4
July	74.0	13.3	62.4
Aug.	73.7	13.6	69.8
Sept.	73.1	11.6	84.7
Oct.	67.4	14.0	80.4
Nov.	72.2	18.1	76.2
Dec.	76.7	16.2	96.9
1949			
Jan.	87.0	21.9	68.8
Feb.	80.9	26.5	70.3
Mar.	93.5	22.3	75.8
Apr.	70.1	23.1	74.7
May	63.7	15.8	72.8
June	53.6	15.7	79.0
July	48.0	14.0	60.7
Aug.	51.5	18.8	67.3
Sept.	57.7	13.7	67.6
Oct.	56.8	13.7	62.3
Nov.	84.3	17.0	67.6
Dec.	82.5	22.4	75.7
1950			
Jan.	99.7	26.7	52.8
Feb.	89.2	18.8	56.1
Mar.	107.4	24.9	75.3
Apr.	98.9	17.4	61.6
May	116.4	18.4	82.5
June	124.1	23.0	91.9
July	253.1	22.3	68.3
Aug.	p 307.7	p 34.1	p 93.7

Data: NMTBA p — Preliminary figures



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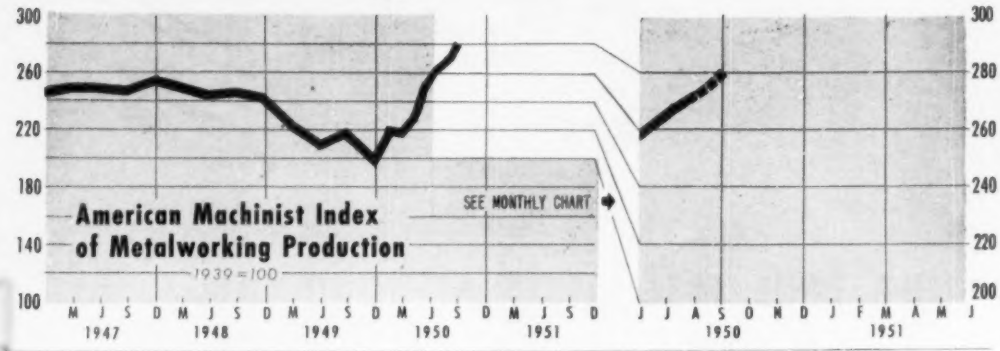
Gaging Metalworking



No Immediate Heavy Curbs on Civilian Goods

Metalworking operations are steadily heading skyward as combined civilian and defense demands for goods pour into the nation's factories. September is estimated at 280 on American Machinist's Index of Production (based on manhours worked). August was 274, and July 266.

Upswing is evident in all segments of metalworking. Scramble is on for materials, particularly steel and copper, and for manpower. Steel pinch is being felt already in some quarters. One appliance maker has curtailed output 10% because of steel shortages.

Civilian goods production will not be seriously affected until well into 1951, however. Reason is that armament manufacture will be slow getting started. Armed services don't know even now how much they will want of certain items.

• • •

Automotive industry has about $500 million of defense business. That is only 5% of its annual dollar volume recently. But it expects a lot more war orders. Some already are represented by letters of intent from Washington.

It's not likely that production of war goods requiring much tooling will be rolling off lines in automotive industry much before mid-1951.

• • •

Electric appliance makers predict output will be down 15% to 25% next year. They expect the most drastic cuts a year from now.

Automobile assemblies in 1951 should be at least 4.5 million cars and trucks, and probably more. Motor car makers may feel steel pinch earlier than appliance people because they are much larger sheet steel users than the latter.

• • •

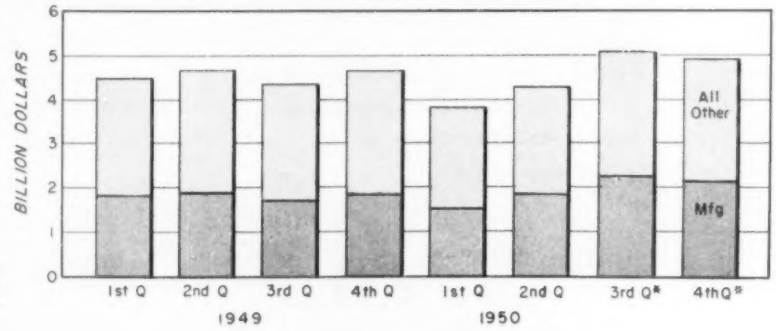
Manpower trouble is causing more headaches for number of metalworking companies than procurement of materials. Trouble will grow as mobilization broadens.

KOREA GIVES LIFT TO CAPITAL EXPENDITURES BY U. S. BUSINESS

Capital expenditures billions of dollars

	Total	Mfg.
1949		
1st Q	$4,460	$1,850
2nd Q	4,660	1,880
3rd Q	4,370	1,690
4th Q	4,630	1,830
1950		
1st Q	3,700	1,520
2nd Q	4,330	1,860
3rd Q	5,160*	2,270*
4th Q	4,780*	2,150*

** Anticipated expenditures*
Source: Securities & Exchange Commission, and Dept. of Commerce.



INDEX

	SEPT. '50	AUG. '50(p)	JULY '50(r)	SEPT. '49
	280*	274	266	222
Machinery	249	244	199	
Electrical Manufacturing	321	303	229	
Automobiles, Trucks	260	256	210	
Transportation Equipment	275	250	238	
Other Metalworking	290	286	235	

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

Potential manpower supply now is put at 69.1 million, or 5.6 million above April, 1945, war peak. Biggest shift will be to metalworking plants, because they will get bulk of defense orders.

Metalworking employment today is 6.3 million, as against 9.7 million in 1943. Aircraft, shipbuilding and ordnance—all of them war industries—are largely responsible for decline.

Shortages of professional and skilled workers are cropping up in some areas. Topping the list in metalworking are engineers, tool designers, tool and die makers, machinists.

Overtime, one answer to manpower problem, is back. Average work-week for factory employees hit 41.2 hours in mid-August; and hours worked in durable goods plants were higher. Boeing hit 60 hours for some jobs.

Areas of tight labor have increased from 12 to 19. Total employment has gone to 62.3 million, a new record.

Capital expenditures for new plant and equipment are up 15% above a year ago. They promise to go higher. Examples: two large companies will add substantially to their facilities, though they have spent tens of millions of dollars on such expansion from end of war up to now.

Five-year amortization of new defense facilities, provided in new tax bill passed by Congress, will act as a spur to new plant and equipment outlays.

• • •

Prices in metalworking are climbing. Wholesale prices have risen 6½% since the Korean war began, and manufactured goods 5%.

Voluntary wage boosts given by automotive industry and others have made higher costs inevitable. Latest predictions: wholesale prices will be up 13% to 22% above last June's level by middle of 1951. Manufactured goods meanwhile will have taken an upswing of 13% to 15% in same period.

• • •

Proposed government program of taking 15% of gross national product for war goods will attain a peak about middle of next year. Metalworking, proportionately, will devote much more than 15% of its capacity to defense, however. It is the part of industry which turns out most of the war goods—planes, tanks, guns, ammunition. Perhaps 30% of Metalworking will be absorbed by war orders.

• • •

Inventory of steel in warehouses has shrunk 40% in past year, according to survey in Middle West. Fact is that warehouses have not been able to stock normal inventory since end of war. Thus depletion of 40% is from a subnormal inventory to begin with.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week index of activity (1923-1925 = 100)*	221.9	220.4	185.0
Steel ingot operations (% of capacity)	100.4	99.6	86.2
Electric power output (million kilowatt-hours)	6,049	6,029	5,556
Production of automobiles and trucks	187,239	151,606	159,493
Engineering construction awards. (Eng. News-Record; millions)	$238.9	$219.7	$188.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production* (1935-1939 = 100)	197	199	161
Index of durable manufacturers' production* (1935-1939 = 100)	235	237	185
Durable goods manufacturers' sales* (millions)	$9,315	$9,569	$7,807
Electrical machinery manufacturers' sales* (millions)	$1,005	$999	$669
Other machinery manufacturers' sales* (millions)	$1,426	$1,382	$1,053
Durable goods manufacturers' sales* (millions)	$11,953	$10,510	$6,195
Electrical machinery manufacturers' new orders (millions)	$1,014	$1,080	$561
Other machinery manufacturers' new orders (millions)	$1,713	$1,514	$858

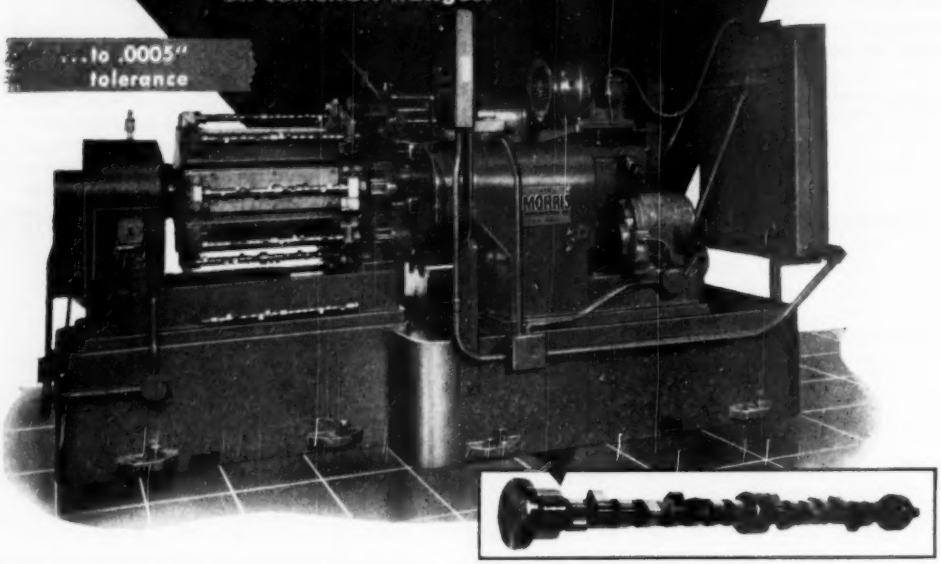
*Seasonally adjusted.

Accuracy plus Speed

MORRIS *Mor-Speed* MACHINE performs 16 machining steps on camshaft flanges.

...Production rated: 200 pieces per hour

...to .0005" tolerance



There's no secret in the amazingly high production records set by MORRIS *Mor-Speed* Machines. Each one produces faster, with micrometer accuracy, more parts at lower cost . . . because it's designed for the specific job. Yet their cost is low, compared to ordinary "special purpose" machines, because each comprises many standard parts, engineered to do the special job.

Four holes on the flange of each of eight precision camshafts are drilled, reamed, counterbored and tapped on this MORRIS 8 Station Indexing Machine. Work pieces are indexed to the hydraulically operated head by means of a Geneva cam mechanism. The lead screw feed tapping head is driven independently by a reversing motor. Eight hand clamp fixtures hold the work pieces. Production is rated at 200 pieces per hour at 80% efficiency.

MORRIS High Production Machines save space, time and costs for leading manufacturers the nation over. If you have multiple drilling, reaming, tapping and boring operations on a mass production basis, ask Morris Engineers for a no-obligation estimate of savings possible on your specific jobs.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Stop Giving Aid to the Enemy

When will our allies stop giving aid and comfort to our potential enemies, and theirs?

HERE ARE the facts behind this pertinent question:

British machine-tool builders shipped over $2.5 million of machines to the Soviet sphere the first half of this year. In 1949, Britain sent 557 new and 864 used machine tools to Poland alone.

Poland today is the French machine-tool industry's best customer. Italian builders recently have taken machine-tool orders from Russia's friendly neighbors.

TO TOP IT OFF, Czechoslovakia and Hungary were the best export markets last year for machine tools made in western Germany. U. S. officials in Germany have let the builders there deal unhampered with eastern Europe.

It is true that traditionally there has been a large and thriving trade between eastern and western Europe. A substantial part of Europe's prosperity was dependent upon such relationship.

But these are extraordinary times. They call for extraordinary and drastic measures.

Russia is building her war-making facilities as rapidly as possible. In that effort, she is helped by her stooges.

In this building program, machine tools are indispensable. For machine tools are instruments of war as well as of peace. Without them, there can be no war production. Hence Russia is busily acquiring all the machine tools she can get from all sources. And she is encouraging her satellites to expand their armament-making resources for her benefit.

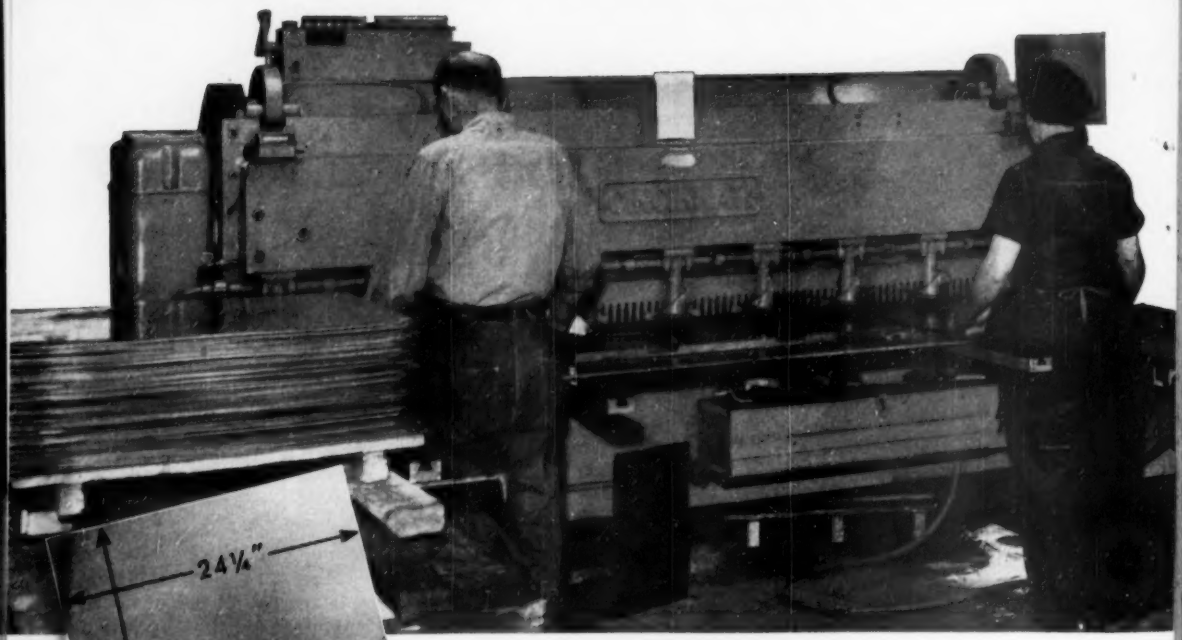
Washington has long recognized what the Kremlin has been up to. That is why it clamped a ban on exports of U. S. machine tools to any country behind the Iron Curtain.

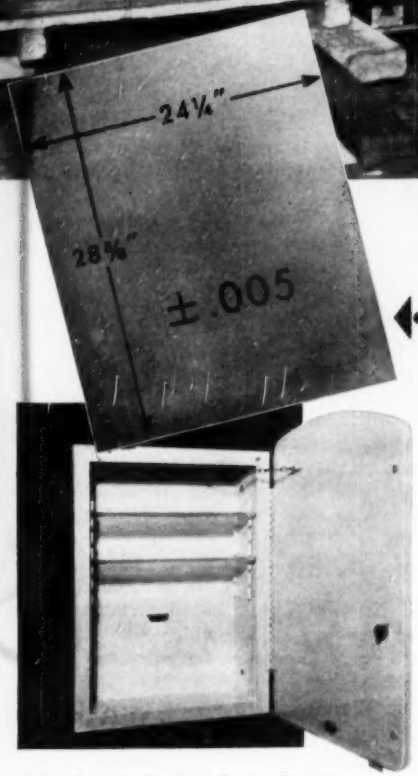
This ban has been in effect over a prolonged period. Meanwhile, our Marshall Plan allies, whose economy has been stabilized by American financial assistance, have continued to supply Eastern Europe with the machines which it could not get from us. And we have let Western Germany do the same thing.

IT DOESN'T make sense. In fact, it is high time that our Atlantic Pact associates stop sending equipment eastward which enables the Communist world to prepare for war. And it is time that Washington cut off machine-tool shipments from Western Germany to Soviet-controlled territory.

Let's not be such dupes as to put into Russia's hands the resources she needs to wage war upon the democratic world.

Burnham Finney





Photos Courtesy The F. H. Lawson Company

These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.

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SHAPERS SHEARS BRAKES

HOW TO LOCATE THE WEAK LINK IN MACHINE TOOLS

The rigidity of a heavy frame can be ruined by a single bolt. Here's a test that locates sources of deflection, points the way to their elimination

BY THOMAS BARISH, Consulting Engineer

THE quality and quantity of work produced by a machine tool varies directly with the rigidity it supplies between the work and the cutting tool. This means not just the spindle, which usually receives most of the emphasis, but also the housing, the housing support, the frame and its joints, the ways, the tailstock, and the tool support; in other words, the *overall rigidity* of the *entire circuit* from work to tool.

Checking the overall rigidity is such a simple matter that it should be routine for all new designs. It might prove worth while as a production check, and also for comparing competitive machines for any given job. On new designs, the proportions of all parts, including frame and joints, can and should be figured to achieve the desired rigidity.

For it is often one soft spot in the whole circuit from work to tool that goes unnoticed and thus cancels the rigidity of all other parts. This occurred in three of four widely varying types of machine tools recently analyzed.

The first of these, a surface grinder, was made for many years with a massive base and an ample upright back-frame to carry the spindle (Fig 1), but only two small bolts held these together at *A*. The resulting flexibility was quickly detected when a vibration meter was mounted on the base at *A*, reading against the back-frame. When adjacent machines vibrated, the meter showed openings of more than 0.0001 in., and larger movements under load at the wheel. An improvement in the quality of the grinding spindle failed to remove fine chatter marks on the work. But with eight more bolts added at *A* (at the same time the new spindle was installed), the machine did far better work.

On the second machine tool, an oscillating ball-bearing race grinder, the work spindle accounted for 80% of the total deflection on the entire circuit. But that deflection was cut in half when the spindle diameter was enlarged and one bearing removed.

In the third case, that of a high-production turning tool, soft tailstock and a large deflection in a liberal vertical cast iron column were noted. The details of the rigidity test on this machine and the eventual remedies are important to an understanding of the general problem.

This unit was developed before the war by the Cleveland Hobbing Machine Co. for high-production turning of rough forgings such as spiral bevel pinions and upset shafts. During the war a slightly modified form of this machine tool turned large quantities of medium-size military shells.

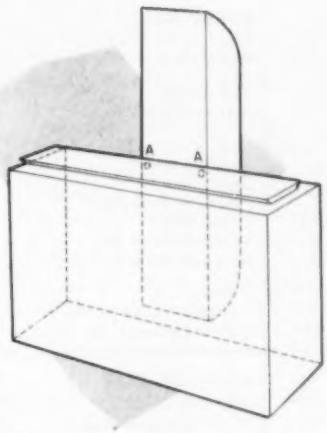


Fig. 1.. Loose connection in this two-part machine frame is due to insufficient bolting at *A*. Evidence from vibration meter led to the addition of new bolts

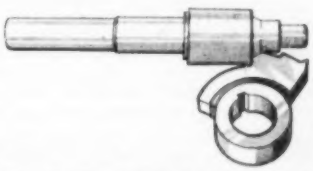


Fig. 2.. Cam cutter is a feature of high-production turning tool. Unlike most cutters, it can be rotated faster or slower than the feed

The principle involves a cam-cutter (Fig. 2) that carries the entire profile of the work and rolls along with it. Normally such a cutter exactly duplicates the work profile, and its circumference equals the length of the cut. However, a new arrangement in this unit makes it possible to rotate the cutter either slightly faster or slower than the cut, and faster or slower than the feed, as desired. This feature affords small cutter diameter (even for long profiles),

DEFLECTION READINGS ON CLEVELAND RIGID-TURNER

Reading Number	DEFLECTION OF	INDICATOR		LOADING A:axial R:radial (on cutter)	DEFLECTION at 760 lb-load	
		Fastened to	Reading on		Before redesign	After redesign
1	**Over-all circuit**	Cutter	Center of work	A	0.0163	0.0108
1a	(less workpiece)				0.0120	0.0068
2	**Work and chuck**	Spindle nose	Center of work	A	0.0062	0.0052
3	Chuck	Spindle nose	Chuck nose	A	0.0019	0.0012
2-3	Work alone				0.0043	0.0040
4	**Work spindle**	Spindle housing	Chuck base	A	0.0018	0.0016
5	Nose bearing spindle	Spindle housing	Spindle nose close to bearing	A	0.0001	0.0001
	Tailstock support					
6	Column-bend	Back plate	Center of column	A	0.00065	0.0005
7	Column-bend and twist	Back plate	Tailstock housing	A	0.0015	0.0009
7-6	Column twist				0.00085	0.0004
8	Tailstock tilt	Tailstock ways	Tailstock housing	A	0.00054	0.0002
9	Same as 8, but locked tight	Tailstock ways	Tailstock housing	A	0.00018	0.00015
	Tailstock					
10	Live center loaded axially	Tailstock ways	Live center	Up	0.0002	0.0001
11	Shaft and bearings	Tailstock housing	Live center	R	0.0035	0.0015
12	Whole tail assembly	Center column	Near live center	A	0.0062	0.0035
	Work Spindle Support					
13	Ways (Sideways)	Main ways	Side of spindle housing	A	0.0005	0.0004
14	Tilt of housing on ways	Main ways	Center of housing	A	0.0003	0.0002
	Toolpost					
15	Tilt and bend of tool housing	Frame	Tool housing center	A	0.0008	0.0006
16	Same with added external locking	Frame	Tool housing center	A	0.0008	
17	Total: cutter and support	Frame	Back of cutter	A	0.0016	0.0008
18	Same (radial)	Frame	OD of cutter	R	0.0001	0.0001
19	Same as 17 without backing plate	Frame	Back of cutter	A	0.0020	
19-17	Effect of backing plate				0.0004 less	
20	Same as 17 without outboard bearing	Frame	Back of cutter	A	0.0032	
21	Effect of outboard bearing				0.0016 less	
22	Over-all circuit—after redesign	Cutter	Center of work	A	0.0003	

rapid replacement of dulled tools without change of setting, and ease in resharpening. Furthermore, the chip shape is ideal for good finish with heavy cuts: The small diameter cutter gives a deep axial cut at the entering point, and a shallow "skiving" effect at the leaving edge.

The machine's design provides extreme rigidity by means of a single, large vertical casting, on which the workhead and tailstock are carried tightly. This casting is supported on two-part ways, top and bottom. The only other sliding joint in the circuit is the support for the slowly rotating tool, and that can be operated with negligible deflection.

After hard war service a redesign was planned which would incorporate lessons learned thus far and produce a two-spindle machine for the economy of a single-speed mechanism. Preliminary to this redesign, an overall rigidity test was made.

A load was repeatedly applied between the work and the tool by a simple bar lever (Fig. 4), while deflection readings were taken at each point in the circuit between them. The figure shows loading radially on the cutter and on the work. Where desired, the loading bar was swung around 90 deg. to load the cutter axially while the work load was still radial. Readings were taken with an ordinary dial indicator with 0.0005 divisions.

For the first test, the indicator was clamped to the tool and the reading taken against the work at its approximate midpoint. Then the indicator was shifted to the other 20 positions (see Table) and the same procedure employed.

The ratio of work deflection to entire deflection, 0.0043 to 0.0163 in. (see readings 1 and 2-3), was doubly significant: (1) It indicated the general need for improving machine rigidity; and (2) it roughly prescribed a top limit. Obviously, it would not be worth while to make the machine more rigid than the work itself.

As for specific cases, four parts of the turning machine made poor showings on the test. The findings and improvements are as follows:

(1) The axial yield of the cutter shaft (Reading 17) led to the introduction of a pair of heavily preloaded tapered roller bearings at the thrust location.

(2) Locking of the tailstock had already been taken care of by lengthening the lever and minor changes in the nut so that tight locking was easily accomplished (Readings 8 and 9).

(3) The tailstock support showed too much yield for a large

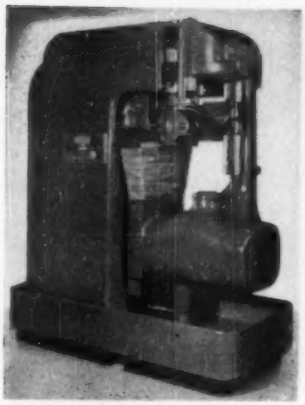


Fig. 3.. Original machine achieved rigidity through use of single large vertical casting. Workhead and tailstock are securely fixed in place on the casting

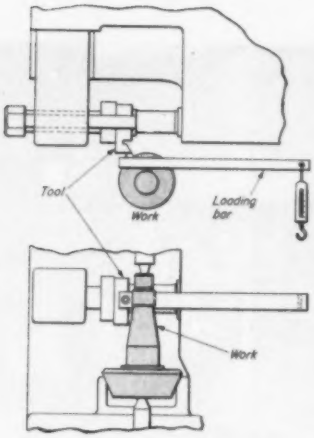


Fig. 4.. Rigidity test centers around a loading bar which is applied between the work and the tool. Here loading is shown radially on the cutter and the work

cast-iron column (Readings 6 and 7), and this was corrected by making the column much heavier, doubling the wall thickness, and shifting the column location slightly, so the cutting load was more nearly in line, with less twisting effect.

(4) The tailstock itself accounted for half of the machine deflection (Reading 12/Reading 1a), which called for complete checking and redesign.

Some deflections were quite small and required no attention. The weakness noted in Reading 4 was unavoidable, due to the large overhang of the chuck and the work.

The relatively large deflections of the live center and its bearings checked closely with subsequent calculations. As shown in Fig. 5, the redesign and its calculations indicate that deflections could be diminished by half.

To achieve this, the shaft diameter was enlarged by changing from light-series ball bearings at the nose, to the new extra-light series having the same outside diameter and larger bore. Then the overhang was reduced as much as possible.

The end-product, a revamped machine (Fig. 6), was again checked for overall rigidity. Final deflection readings (last column of table) show the desired increase in rigidity and thus prove the validity of the test.

Performance possibilities of the new unit were demonstrated in surprising fashion. On the first two setups, the two spindles were arranged to rough on one and finish on the second. Despite the high rate of metal removal (up to 0.020 feed, ¼ in. deep at 800 rpm), the finish on the roughing was so good that no finishing cut was necessary. Surface finish resembled that of a fine carbide tool, and tolerances were held to within 0.003 in.

One modification in the checking method was later evolved on another machine. If the loading lever is arranged with loops or hooks so that the direction of loading can be reversed, the indicator readings can be divided into (1) true deflections, all in one direction and reproducible, and (2) looseness or "shake," the difference between the zero readings with reversed loading.

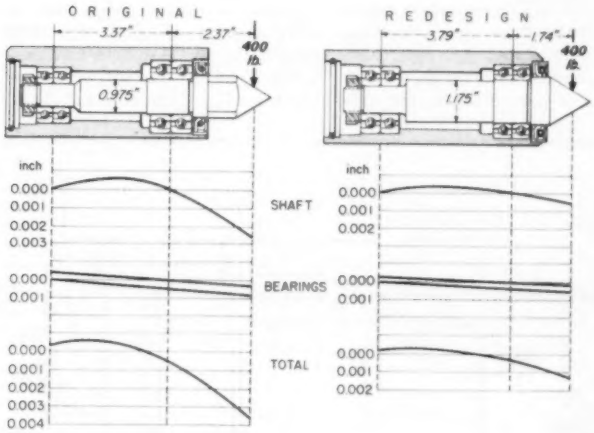


Fig 5.. Redesign of live center, when compared with the original, shows that deflection can be cut in half without changing related parts of the machine

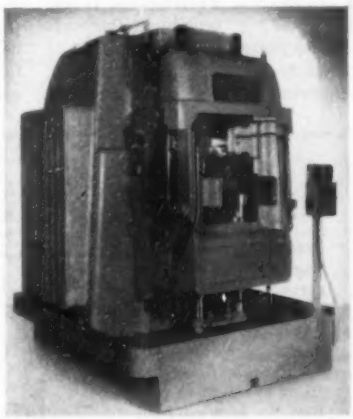
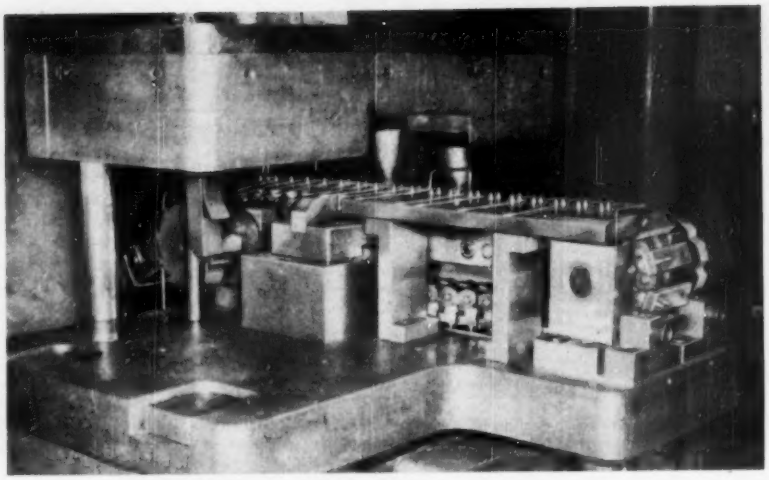


Fig. 6.. Improved unit highlights increased overall rigidity. The surprising success of a trial roughing cut testifies to the worth of deflection testing



Chain feeder consists of 46 roller-chain links of ¾-in. pitch carried between two 10-tooth sprockets spaced 13½ in. apart on die shoe. Spring-loaded detents lock detent wheels on each of two sprocket shafts after chain advance of one pitch by pawl attached to punch holder. This arrangement insures accurate positioning of chain-carrier gage blocks

CHAIN FEED CARRIES SPRINGS THROUGH FORMING DIE

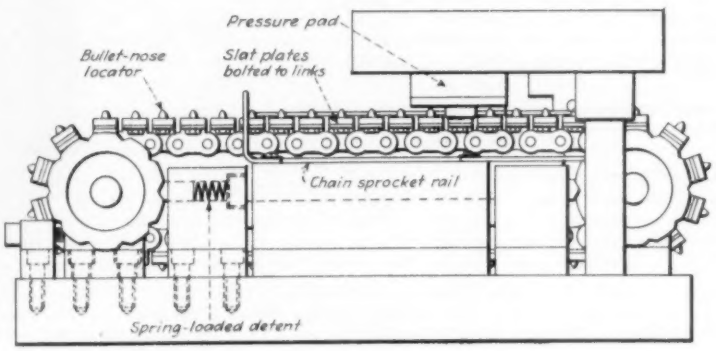
By J. D. THOMPSON, Design Engineer, and G. W. RADA, Product Engineer, Hawthorne Works, WESTERN ELECTRIC COMPANY

LEAF SPRINGS for cross-bar relays used in telephone central-office equipment must be bent to carefully predetermined shapes. The forming operation insures that required contact pressures will be developed when the relays are assembled.

Since all springs have the same size mounting-screw holes, spaced the same distance apart, they can be accommodated by one chain feeding device. Only the form block assemblies are changed for different sizes and types of springs pretensioned in the press.

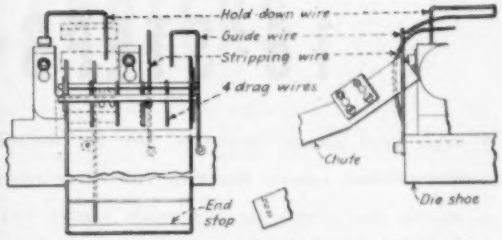
Leaf springs are made in two lengths, and pretensioning bends have been standardized as much as possible. At present 13 form-block punch and die assemblies are used for pretensioning 28 springs.

Tools shown are mounted on a standard press with 2-in. stroke, operated at 90 strokes per min. Production ranges from 2200 to 2500 springs per hr, depending principally on the difficulty of handling some of the spring shapes when loading them onto the chain.

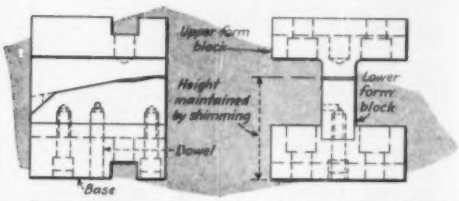


Pressure pad holds workpiece firmly to carrier block of the conveyor, while the upper forming block bends the outer end of the leaf spring. Parts are kept in position by a wire hold-down (end view) which passes through a slot in the pressure pad

Guards fully inclose the spring-tensioning die and chain feeder. Heavy sheet metal guards also inclose the flywheel and pitman. Work-loading problem is to position leaf springs with contacts up and screw holes in part over bullet-nose locater pins on the conveyor slats of the chain feed

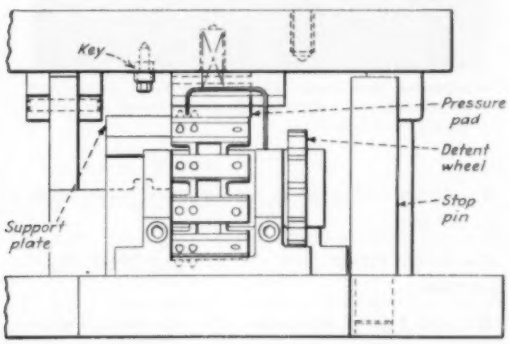


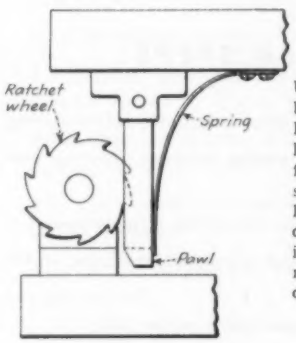
Proper delivery of formed springs to the chute is the function of stripping, hold-down, guide and drag wires properly formed and supported for their several tasks. A device like this avoids need for a second operator to remove and stack the finished parts



Form-block die sets are all made to the same forming height, so that any spring moved to the forming position will be located properly for bending. The die set shown will form eight different springs

Springs are positively removed from the die and point in the same direction, in order to eliminate sorting, through use of wire hold-downs and strippers





Upper and lower form blocks are located by keys and diamond-headed pins. These form blocks are tool steel hardened to Rockwell C 60-62. Indexing the chain feed is done by a pawl and ratchet at rear of the device

16 STEPS FOR WELDING

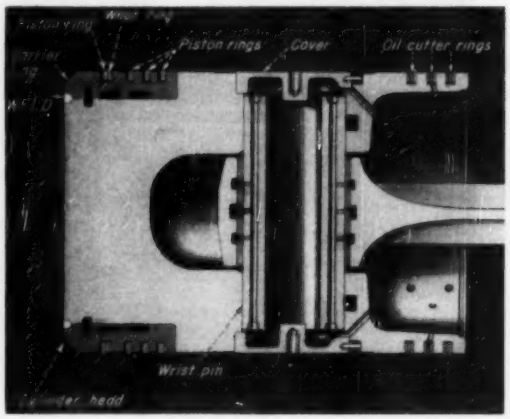
It takes good process control to turn out welded aluminum-alloy pistons without rejects. Nordberg and Alcoa cooperated to outline a process that shrink-fits and welds carrier rings to pistons for the new radial diesel engine Nordberg is producing. The result — a complete process outline — is a study in good welding procedure

BY HAROLD E. BAILIE, Welding Supervisor, NORDBERG MFG. CO.

THE largest aluminum-alloy pistons welded in this country so far are produced under almost ideal conditions. The critical assembly job—welding carrier rings to the pistons—takes place with the joining surfaces clean (because they are wirebrushed immediately before welding) and with the temperatures just right (because we even go to the extent of closing doors and windows to shut out cooling drafts before welding).

Pistons of 32S-T6 and carrier rings of B18S-T71 are heat-treated and fully machined, then cleaned with a rotary brush on a portable grinder. They are delivered to the welding room with the pistons loaded skirts down on the trucks so the rings, after preheating, can be dropped in place.

Preheating is done on a 40-kva transformer head equipped with a thermocouple that can be advanced



Carrier ring holds four pistons, one wear ring. Only junction to piston is deep circular weld on top

Induction unit preheats carrier to 350 F, is checked by thermocouple operated by air cylinder, and shuts off automatically

THE SIXTEEN STEPS:

1 *. . Wirebrush top of piston immediately before welding*

2 *. . Locate piston on welding positioner, clean top with carbon tetrachloride*

3 *. . Preheat weld area while piston is rotated one turn*

4 *. . Wait 1 min for heat to soak, set transformer at 400 amp, 100 v*

5 *. . Preheat piston again until it reaches 340 F*

6 *. . Locate cooling clamp around piston, set turntable for 5.7 ipm*

7 *. . Locate copper plate over piston, establish arc to electrode*

8 *. . Check gas in flow meter and water through drain,*

PISTON-RING CARRIERS

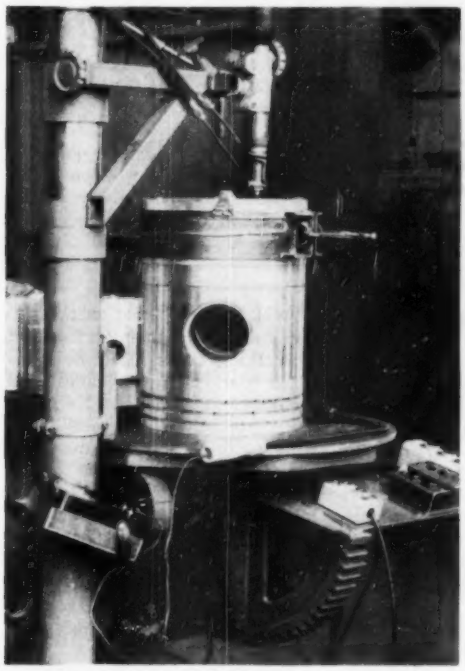
to touch the rings at any time. The cycle is automatic, and the rings are removed and placed on the pistons immediately after the temperature of the rings reaches 350 F. The temperature is important because if it is low, the rings will not slip over the pistons for the shrink fit, and if it is too high it will ruin the temper.

For transportaton to the welding positioner, the assemblies are covered with preheated aluminum hold-down rings and weights.

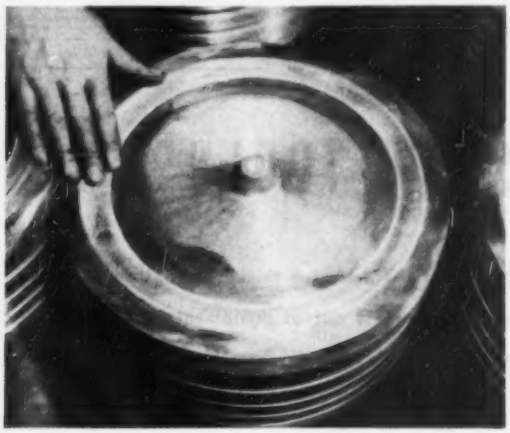
Welding is done on a Cullen-Friestadt positioner, specially conditioned to remove backlash. The column of the positioner carries a Linde No. 175 multiflame torch for preheating and the water-cooled Type HW welding head with a 3/8-in. tungsten electrode. Power is supplied by a General Electric transformer that delivers 180 to 800 amp at 100 v, single-phase. Like the induction-heating transformer, this unit is water-cooled and fitted with a pressure switch that shuts down if inlet water pressure drops below 50 psi.

A high-frequency unit in the power supply starts the welding operation with a 1/3-sec. cycle. Argon gas for the controlled atmosphere and the automatic crater filler are also controlled at the power supply. This crater filler gives flush bead ends and overlaps the circular seams smoothly on a second rotation of the work.

Work is located on a fixture plate on the 31-in. positioner table. The positioner has a 2500-lb capacity and variable speeds controlled by the pushbutton panel.



Welding positioner has preheating torch and Hellarc head supported from vertical column. Pushbuttons in foreground control complete cycle



Finished piston has crack-free weld, completed by facing and turning on large turret lathe

check solenoid valves

9 *.. Cut arc, remove copper plate*

10 *.. Start table rotating, locate electrode over piston, start arc to work*

11 *.. Lower electrode to piston-top level with air cylinder, raise current from 400 to 535 amp*

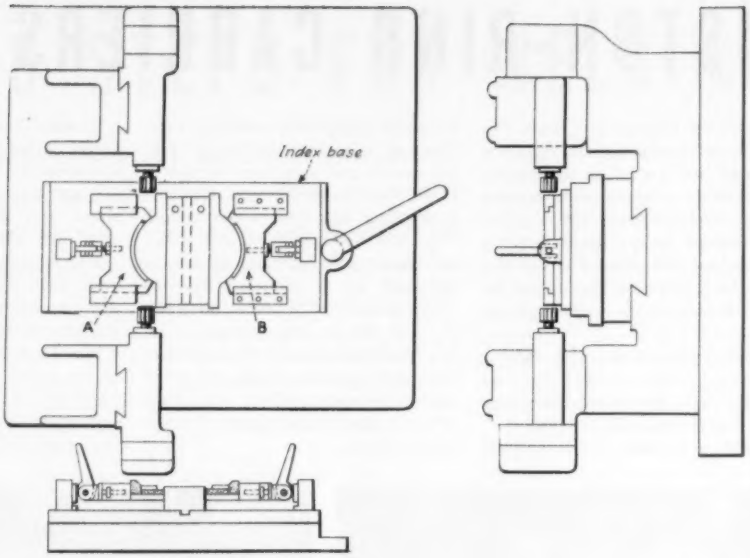
12 *.. Reverse table motion after 3 in. of welding is done*

13 *.. Reverse motion again at original start point, complete full rotation*

14 *.. Check temperature of work with thermocouple, start cooling water*

15 *.. Start crater filler, speed table to 18 ipm, make second rotation*

16 *.. Return equipment to original conditions, remove piston with lift*



Cutting time is used to reload the idle fixture *B* on the index base, while fixture *A* is in the cut. After table returns to right-hand position, operator unlocks the index base, swivels it 180°, and presses start button for automatic milling of work in fixture *B*

SLOW TOOLS WILL BACKFIRE

The man who does not think constantly about how to get the most out of equipment or devise better methods may end up looking in from the outside

By B. P. FORTIN, Sr.

FULL production value of machine time is not utilized in many shops. Slow-operating tools are used. Full advantage is not taken of correct cutting speeds and proper cutting materials.

From experience, I find that selection of feeds and speeds is left more or less to department foremen. Few of them know anything about the subject. It would be a good investment for any plant to have a competent man constantly checking speeds.

Cost of tools is regulated to an extent by production requirements. It does not pay to make expensive tools for a small production run, nor if there is any possibility of parts being changed in the near future. If required production is 5,000 pc in 40 hr, and no change in part is anticipated, it will probably pay to design quicker-operating tools than many seen in use. And if speeds and feeds are given more thought, it should not take long to amortize the difference in cost between slow- and fast-operating tools.

I had an experience during the first World War that brought out what can happen with slow tools and not selecting the right feed and speed for the job. One day I met a man whom I had known for years, and while talking about old friends in the same shop, I inquired about the chief designer.

My friend said: "The most humiliating thing happened; it made us all feel like amateurs. You considered the chief a good tool designer?" I agreed.

"Well, here's what happened. You know our company is financed by a Boston concern and they engaged Carl Barth to investigate conditions at the plant. He found that the machines were only operating 60 to 75% of the machine-operating time and that 30 to 40% of the time was used in cleaning, loading, and clamping work. Also, cutter speeds and feeds were too slow, and cutters were carbon steel instead of HSS. At Mr. Barth's suggestion, fixtures and jigs were changed, also feed and speeds. The results were surprising."

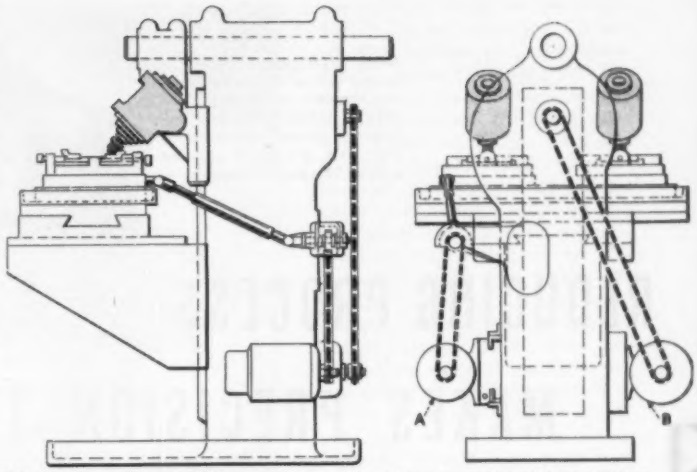
This story made a deep impression on me, and whenever I had the opportunity on existing jobs or new designs, I gave the job all it could stand.

From experience, I submit that it is much easier to design fixtures to eliminate loading time for milling than for drilling. Multiple-spindle drillhads perform wonders in increasing production, but do not cut out fixture-loading time. If

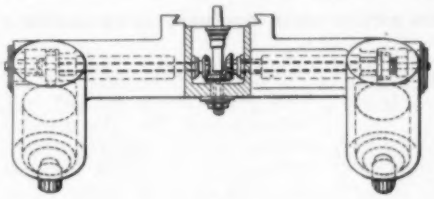
production warrants, use a special machine. This will minimize or eliminate loading time if correctly designed. And if feeds and speeds are what they should be, the special machine will provide a saving over any other method. All the operator has to do is to insert the work in a revolving turret. The machine automatically clamps the work and performs the various operations, then ejects the pieces automatically.

There are a number of ways to eliminate loading time as interference to effective use of machine time. One method is the use of an index base on a milling machine, and it deserves more consideration than presently enjoyed. An index base is useful primarily when the loading time is less than the cutting time.

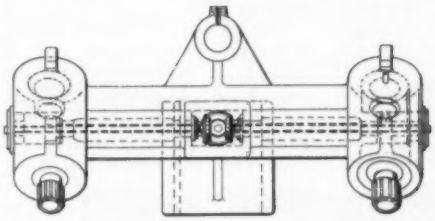
Rotary continuous milling is another excellent method of producing small parts. If the machine is fitted with two cutter heads and two power-driven rotary tables, the operator will have little waiting time between loading and unloading of fixtures. On one job set up in this manner, the spindle speed was 300 rpm, the table feed 14 rpm, the cutter diameter 1½ in. and 8 teeth, work material was cast iron. With a depth of cut of ⅛ in., production per hour was 130 pcs with 4 pcs in the fixtures. There was no lost time for loading and unloading, but the production was all that the operator could handle. At that time cemented-carbide cutters were uncommon.

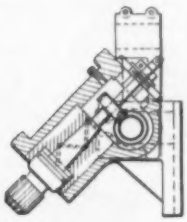


Advantages of rotary milling were obtained by fitting two rotary tables and two cutter heads to an old machine. Speed reducer *A* drives the rotary tables through a chain and universal joints; speed reducer *B* powers the cutter heads



Worm wheels and bevel gears incorporated in the milling-machine column, transmit power from the speed reducer to the two cutter heads.





Tips FOR TOP SHOP MEN

354 Get to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

355 The old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

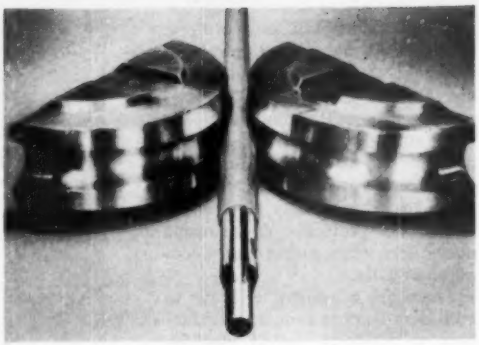
356 Sabotage is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

357 Color and language are not the only criteria of a man's ability. Some refugees are skilled mechanics, for example, and hate the same things Americans hate. Somebody in World War II said the way to tell a man's potential is to look for a light in his eyes. Dull eyes usually go with dull wit or dulled ambition.

358 Morale isn't built in a crisis; it's built beforehand. The crisis only tests it.

359 There's an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.

360 There's one flaw in the old saying about the better mousetrap. Somebody else must find out it has been made, or the world will never know. Remember that about plans and policies too; if you want them known, tell somebody; if not, don't even tell your wife.



Basic principle of Tube Reducing Corp's "Rockrite" process consists of feeding tube over a tapered mandrel between a pair of reciprocating dies with a tapered annular groove of special design

REDUCING PROCESS MAKES PRECISION TUBING

Production of accurate internal shapes and precision, straight or tapered tubing is possible by compression reduction process which also improves mechanical properties of hot-finished stocks

By H. E. LINSLEY, Associate Editor

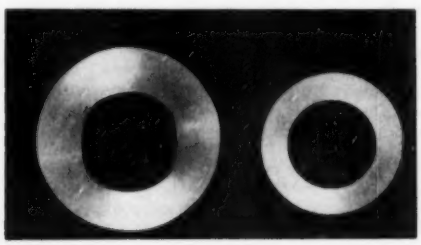
INACCURACIES in OD, ID and wall thickness, inherent in hot-finished tubing, frequently compel the designer to specify the more expensive cold-drawn product, even though its structural strength is far above design requirements. Commercial hot-finished tube usually has a wall thickness variation of 12.5 to 16.5% (depending upon OD/wall ratio) which may require the use of considerably oversize stock when parts are to be machined from it.

This difficulty can be overcome with cold-reduced tubing on which the ID can be held to a total tolerance of 0.005 in., the OD to plus 0.012 minus 0.000 in., and wall thickness to ± 5%. The reducing process not only improves concentricity, but also greatly increases the yield strength, sometimes as much as 100%.

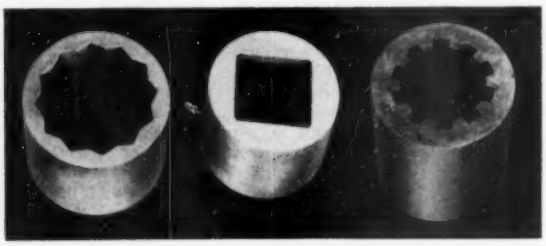
The amount of surface decarburization of the original stock is reduced in proportion to the amount of elongation produced, and the improved machinability makes possible higher speeds and feeds when subsequent machining operations are necessary. Screw machine production can often be increased by more than 50%. In the production of socket wrenches, for example, the ID is formed to the desired nut size and the stock merely cut off to length and cross-drilled for insertion of the handle.

In the reducing process, as performed by Tube Reducing Corp., the work is passed between a pair of curved oscillating dies and is indexed one-sixth of a turn at each stroke. The tube is thus always in compression and its physical properties are substantially increased. The increase in hardness is not merely a skin effect, as in cold drawing, but exists throughout the metal. On SAE 52100 steel, for example, the Brinell hardness in the spherodized and annealed state will be 187-207, with a yield of 80,000 psi. After reduction the yield will be 160,000 psi, and the hardness 265-300 Bhn.

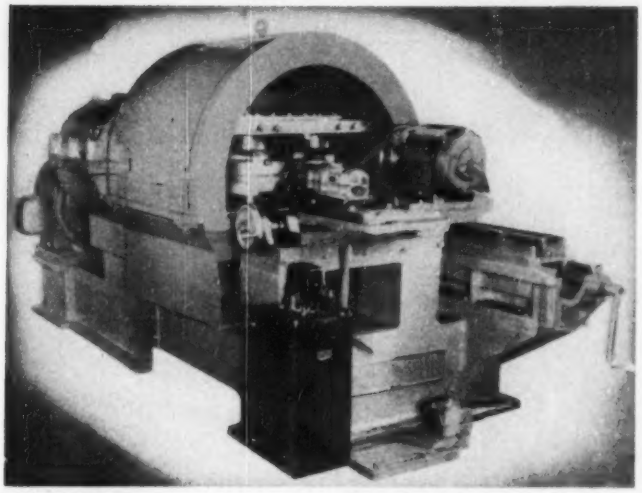
Amount of reduction varies with



Hot-finished tubing (left) frequently exhibits wide variations in wall thickness, circularity and concentricity. The same tube after cold reducing (right) shows excellent uniformity



Internal shapes of almost any desired regular or irregular form can be produced by the reduction process to such close accuracy that subsequent machining is frequently unnecessary. Those shown are typical of the many available.



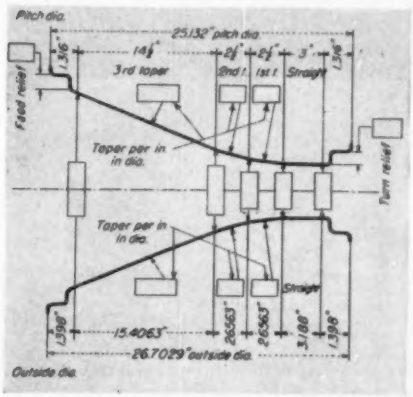
Taper grinding of rocker dies requires a special machine in which the dies can be reciprocated as in production, and the head set over to produce the necessary degree of taper

the composition of the steel and the original size of the stock, but may run from 40 to 80% of cross-sectional area in a single pass. For greater reduction, an anneal is usually necessary between passes. Speed also varies with size and material, and amount of reduction. To reduce 2⅛-in. OD tubing with ⅜-in wall to 1.384-in. dia with 0.224-in. wall, the machine will operate at about 90 strokes per min and a feed of 0.220 in. per stroke. A soluble-oil coolant is used on the OD, but the ID is lubricated with a mica lubricant fed through the hollow mandrel rod. On stainless steel it is necessary to employ a lubricant on the OD, as this material tends to stick to the dies.

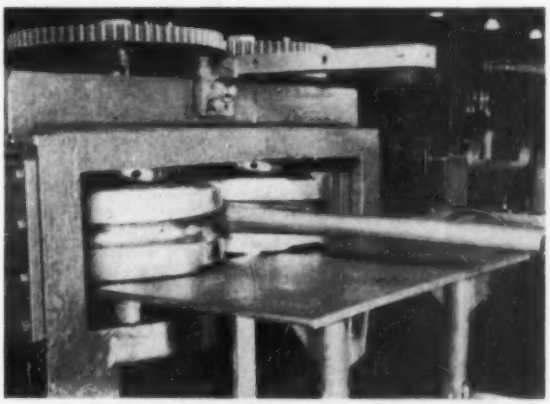
Production of tapered or stepped-diameter tubing is quite practicable. The former is used largely for the core of steel propeller blades, and the latter is particularly useful for the manufacture of helicopter spars where constant torque is to be maintained. Specially shaped ID's are readily produced by suitably formed mandrels, the more common being square, hex and splined. Mandrel wear, controlling ID, is extremely small, but die wear is somewhat heavier, and it is customary to allow a maximum variation of 0.012 in. for this.

Dies are made from SAE 52100 steel, and their design is highly critical. The semi-circular grooves formed in the periphery of the dies taper from a maximum dia—corresponding to the original OD of the stock—to a minimum—corresponding to the finished OD—which is constant for a short section to insure accurate sizing. A set of rocker dies is good for only one specific size of tubing, and must be replaced when it has worn to the maximum allowable. It can, however, be reground to serve for a larger-size tube. Maximum capacity of present equipment to 6-in. OD, and minimum to which tubing can be reduced is ⅞ in.

A particular advantage of the reducing process is that it enables a manufacturer to use up stocks of unwanted, large-size tubing by having it reduced to some wanted size. The process is fast and can sometimes be performed more rapidly than new tubing of the correct size can be obtained from the mill.



Standard layout for a 17-in.-dia die shows developed contour with blanks to be filled in by the designer. Actual taper per in. varies with material and can be determined only by experience

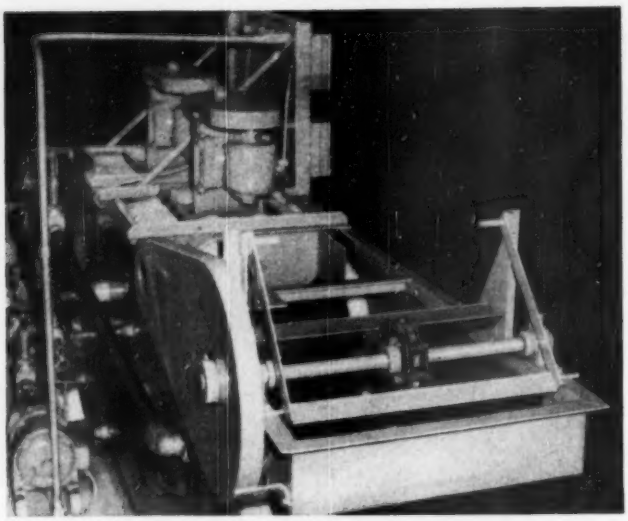


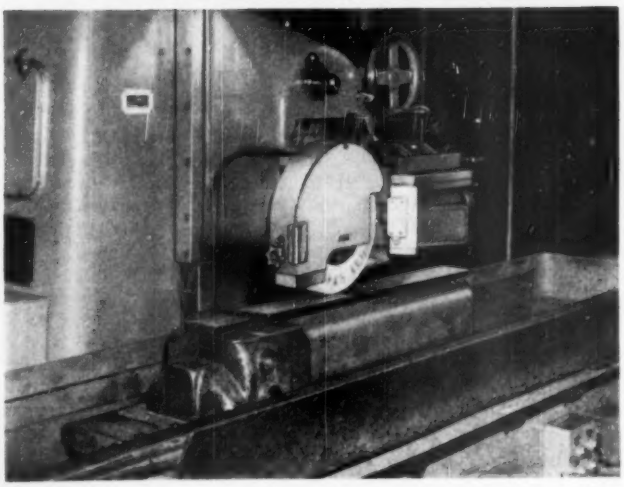
Die tryouts are conducted with lead tubing on a special checking machine before hardening and finishing grinding. This avoids slow and expensive alterations on finished dies. Operation is identical with that of production machine

SHOP SHOTS

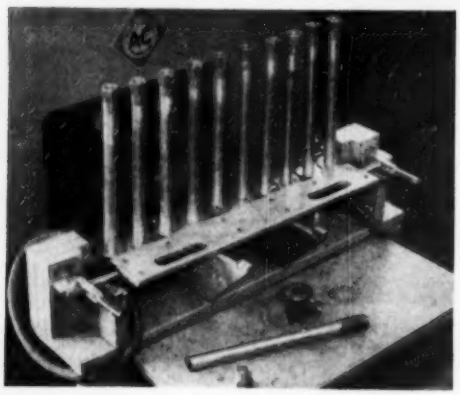
at

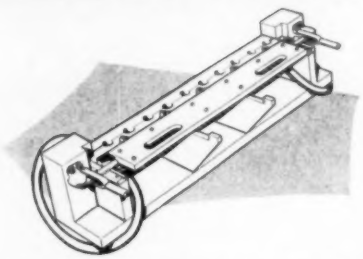
- **HARDINGE BROTHERS**
- **COLUMBIA STEEL**
- **NOBUR MFG. CO.**
- **ALLIS-CHALMERS**



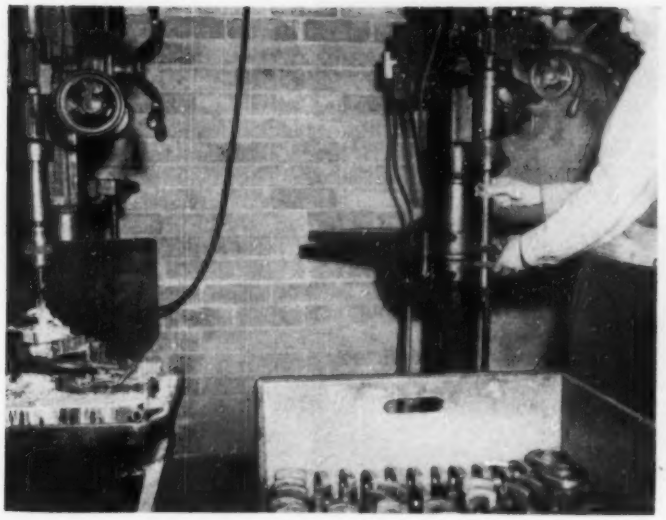


Clean coolant for four Thompson grinders goes through a centralized U. S. Hoffmann flotation unit that processes Cimcool at 80 gpm. After six months, original coolant is not rancid and has been added to only to make up losses at machines. Precision grinding finishes lathe ways to replace hand scraping, which cuts costs and holds quality. *Hardinge Brothers.*



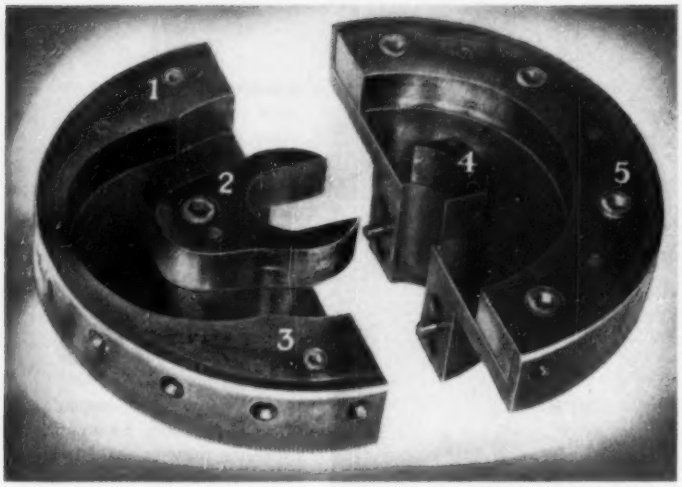


Ten-station induction fixture has split coil that pulls forward so freeze-proof faucet parts, flux, and soft-solder rings can be loaded. Silver contacts lock together when fixture is closed, which completes coil circuit. Method makes strong, tight bonds with fast (50-sec) working cycle and low material costs. *Allis-Chalmers.*



Chamfering spindle set up close to power drilling machine deburrs four holes in cast-steel cylinder heads while drill works on next head. Operator loads part and engages automatic feed on first machine, then moves drilled part to second machine for deburring operation. Work supply is placed for convenient handling and setup is planned for minimum of operator motion. Double job costs no extra operator time at drill, but saves time before assembly. *Nobur Mfg. Co.*

Eight jaws on lidding machine crimp 11½-in. lids made from 26-gage cold-rolled steel onto 100-lb fiber nail containers. Machine jaws fit around inside circumference of flange on lid, then expand outward. Result is a lid crimped so tightly to cover that removal with upward thrust of axe or cleaver is necessary. Drive is 5-hp motor. *Columbia Steel.*



Cam assembly consists of standardized housing in which standardized cam sections (1 through 5) are fastened. As parts are precision ground, cams are interchangeable and can be preassembled. Setup time is slashed and presses run 50% faster

Cam Standardization Ups Forming Speed 50%

Setup time, tool breakage, and down-time also are greatly reduced on machines for ribbon and wire

BY S. J. ANDREWS, Works Manager
TINNERMAN PRODUCTS, INC., CLEVELAND, O.

FASTENINGS are made chiefly from coiled ribbon steel at Tinnerman Products, Inc. Considerable forming is done in Nilson wire-forming machines, each of which includes a small press-head in addition to slides that operate forming tools. Each slide is controlled by a roller in a track cam. In all, about 250 cams are needed to handle the many different parts that are run through each machine.

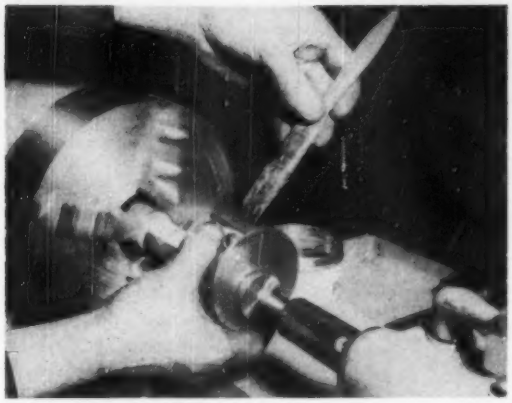
Cams, though similar in design, are not always duplicates and are required in many different contours. Those furnished with the machine, though meeting the requirements of the average user, were not satisfactory for the high-speed and precision needed in Tinnerman operations. They were not interchangeable and could not be changed from machine to machine without much longer setup time than was economical.

Tinnerman engineers have solved this problem by developing sets of cams and cam housings that can be interchanged from machine to machine and that have the close dimensional limits needed both for precision and high speed. The cam housing is split axially and is cast in two halves, which are clamped to the camshaft. Each housing is flanged to form a recess in which five cam sections are fitted. Three of these form the outer contour of the track; the other two form the inner contour. Each section is of oil-hardened tool steel and has dowel pins to fit mating holes in the housing. Recessed-head fastenings in stepped clearance holes clamp the sections against the housing.

The housing is Grade A Meehanite, flame-hardened and ground to hold the close limits required and to avoid wear. The cam sections and the roller also are ground to close limits. Thus, when clamped in place, the cam sections form a track that fits the roller closely at all points. Because of this fit, and the carefully developed cam contours, the machines can be operated at speeds as high as 200 rpm as against a maximum of 134 rpm previously. As the tool motion is precisely controlled, the chance of tool breakage is reduced and down-time has been cut, not to mention the reduced cost for replacement of the tools themselves.

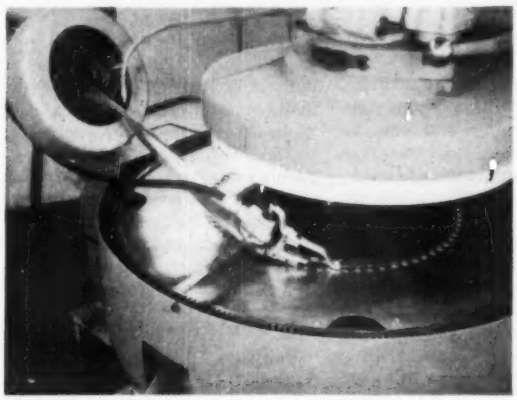
For each production item, there is a setup card listing the cam parts required. This set, if not already in a housing, is drawn from the toolroom and assembled on a bench. The setup man then simply assembles the cam on the camshaft and locks it in the correct angular position.

The expense of making a full set of precision cams has been considerable, but will be amortized out of the savings attained. Lowered setup- and down-time are important economies and an additional advantage lies in the fact that the products now are held within closer dimensions, as the latter depends less upon the skill and judgment of individual setup men. As machines operate a greater proportion of the time and at higher speed, fewer machines, lower machine investments, and less space are needed for a given output.



HAND lapping is a skilled operation. Here, ring lap is moved back and forth over part as loose abrasive is fed through slot with brush

HOW TO LAP



MECHANICAL methods range from simple tooling to high-production setups with automatic part handling. Small brass washers, above, are brought to size in one revolution of workholder. Operation is continuous except for dressing

BY MILES J. ROWAN, ASSOCIATE EDITOR

THE trend toward greater precision in manufacture lays increasing emphasis on lapping as a production process. Throughout Metalworking, tolerances are growing closer and specific surface-finish requirements are demanded. In some cases, remarkable results can be obtained through improved grinding techniques, but, if this fails, lapping invariably is capable of meeting the most exacting specifications. This is true primarily because of the basic principles of lapping—principles that differ considerably from those of other methods of refining metal surfaces. It should be made clear, however, that there is some vagueness in terminology regarding lapping and honing. Several vertical-spindle machines described in this report as lapping machines also are known as flat-honing machines. No attempt is made here to establish either wording as preferable. To be consistent, however, the word lapping will appear throughout the text.

This report discusses the principles of lapping and the methods by which the operation is performed. Particular attention is devoted to mechanical lapping with general-purpose equipment. Different machines are described and the requirements of typical workholders for representative classes of work are explained. Hand lapping is touched upon briefly and a short description of gear lapping and the lapping of camshafts and crankshafts also are given.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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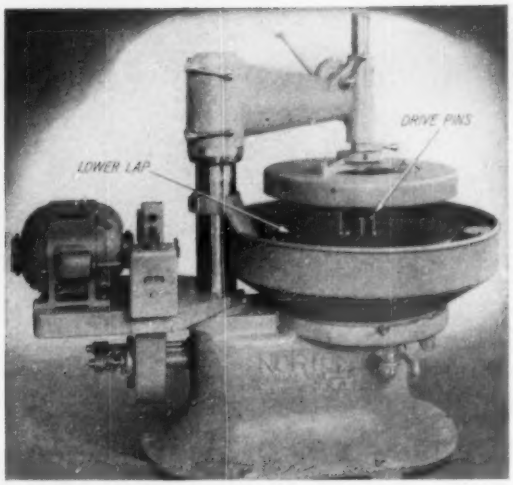
WHAT IS LAPPING AND WHY IS IT NECESSARY?



Vertical lapping machine can do either round or flat work. Pieces rest on lower lap in workholder (not shown) driven by eccentric pins. Lower lap rotates but top lap rests on work and is stationary. Machine has cast-iron laps and operates with loose abrasive

LAPPING is a method of removing metal in small amounts to obtain accuracy of dimension and refinement of surface simultaneously. Basically, the work is moved with an ever-changing motion over the entire surface of an accurately finished lap that is properly supplied with an abrasive mixture of correct specification for the job. These elements—an accurate lap, an ever-changing motion, a carefully selected abrasive mixture, and correct pressure on the work—are essential to all lapping operations, both hand and mechanical.

Hand lapping can be done on flat, cylindrical, and internal surfaces and usually is done with loose abrasive and a metal lap of proper shape for the work. Mechanical lapping includes a number of machines and methods. General-purpose machines include vertical-spindle units with two flat laps mounted in parallel planes one directly above the other. One type operates with loose abrasive and its laps are heavy cast-iron rings. Another type has laps that are bonded abrasive wheels. Both machines, when equipped with the proper workholder, lap either flat or cylindrical work. Also intended for general production, but primarily on parts with flat surfaces, are machines with a single lap. Production lapping also can be done on centerless machines that operate on a continuous, through-feed basis. In addition, several other machines are made for more specialized applications.

Loose abrasives and cast-iron laps give excellent results on hardened steel, but generally are not recommended for cast iron, soft steels and non-ferrous metals, as the abrasive tends to imbed in the work rather than the lap. However, these softer metals can be lapped readily with bonded abrasive laps. With the proper wheel, a smooth, bright finish can be obtained and there is no danger of abrasive particles being left in the work. A flood of filtered, and sometimes refrigerated, coolant is recommended whenever abrasive laps are employed.

Through lapping, it is possible to produce an optically flat surface which may be accurate to one-millionth inch, with a surface finish of less than one micro-inch rms. These limits are beyond normal working practice, but, on production work, shops are working regularly to 25 millionths for flatness, parallelism, and size and to surface finishes of 2 to 3 micro-inches rms. It must be remembered, however, that accuracy can be insured only when the product is perfectly stable. Heat treatment must relieve all strains in the work. If not, distortion will occur later and accuracy will be lost. Likewise, springy work requires a very light cutting action to avoid all distortion during the operation.

Why Should You Lap?

The reasons for lapping are numerous. As many surfaces can be finished to 2 or 3 micro-inches rms without difficulty, lapping does much to eliminate wear in parts that slide together. Furthermore, as tolerances to 25 millionths can be held readily, mating parts can be made to fit initially with the proper clearance for correct lubrication. A "running-in" period often can be eliminated, as well as the uncertainty involved in relying on wear to produce the desired clearance. Metal-to-metal joints that are oil-tight and gas-tight also can be obtained by lapping.

A similar application, but one that is somewhat less exacting, is the finishing of mounting surfaces on castings when alignment in assembled parts is important. Usually when lapping is selected for this type of operation, it is because lap-

ping can be done without clamping the work. By other methods, in which clamping is required distortion can occur and can cause errors too great for the application.

In some cases, accurate measurement of physical dimensions cannot be made without the high degree of perfection made possible by lapping. Optical methods of measurement are not effective unless the surface is highly refined. Finally, in any precision product, lapping promotes interchangeability and ease of assembly.

At the same time, mechanical lapping is a far cry from the tedious procedure of hand lapping. Many machines lap in multiple, often with as many as 35 pieces (and sometimes with well over 100 pieces) produced in a machine cycle that is very little longer than that required for a single piece. Both these and the centerless machines operate automatically so one man can tend from two to five machines. As a result, the benefits of a lapped surface usually far outweigh the cost of producing it.

HOW IS HAND LAPPING PERFORMED?

THE oldest method of lapping metal is with hand-held tools. It is a tedious operation, however, requiring considerable skill on the part of the operator. It now has been largely replaced by mechanical lapping except for small quantities or for exceptionally hard materials on which other more productive methods are not practical. It is a common tool-room method and is particularly useful in producing carbide die parts (*AM*—Sept. 25 '47, p90-94). It is possible with hand lapping to produce the finest "black polish" obtainable on hardened steel.

Flat work is lapped by passing it with an ever-changing motion over an accurately finished surface covered with a suitable abrasive mixture. The rate of stock removal and the finish obtained depend primarily upon the pressure exerted by the operator. The lap can be round or rectangular, with or without serrations. The latter are preferred for perforated surfaces or large areas. The lap should be a perfectly plane surface and, as the accuracy of the work depends upon the accuracy of the lap, care should be taken to cover its entire surface during the operation. In this way, lap wear is equalized.

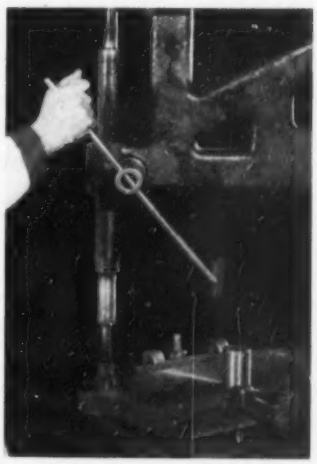
For reconditioning flat laps, it is advisable to have three laps of identical size, and to lap one to the other in the sequence of 1 with 2, 1 with 3, and 2 with 3, repeated until all are uniformly lapped by each other.

For external cylindrical surfaces, a ring lap is employed. The work is rotated in a lathe at approximately 250 sfpm and the ring is slid back and forth, with lapping mixture fed through the slot. The length of the ring should be nearly that of the work up to lengths of about three to four times the diameter of the work. Longer laps are difficult to slide. The lap is adjusted to a light running fit and as the operation progresses is readjusted to the work. The operation requires considerable skill, as adjustment must be made by feel, but, properly done, will correct errors of roundness or taper up to 0.00005 in.

Internal lapping can be done by rotating the lap in a lathe and sliding the work back and forth over the lap at a fairly rapid rate. The lap should be somewhat longer than the hole and driven at a speed about half that required for a drill of the same size. Large parts can be done in a drillpress with the lap driven through a universal to permit correct alignment with the hole. Approximately 0.0002 in. stock allowance is sufficient for the lapping of small steel parts, such as drill bushings or ring gages, with no more than 0.0005 in. on large holes in cast iron.

The operation can be done either with a series of solid laps of progressively larger diameter from the unlapped size up to the finished diameter or with adjustable laps. Solid laps, except in very small sizes, normally are made of cast iron and are grooved with a right and left hand helix along their length. Lapping mixture is fed through these grooves; they also reduce the tendency of the work to pull onto the lap. Adjustable laps with replaceable lapping sleeves are available in several designs that permit expanding the lap to fit the hole.

In both external and internal lapping, accuracy depends largely upon a good fit between the lap and the work. Lapping surfaces must be straight and round and should be tight enough on the work to generate a slight amount of heat during the operation. Laps should be made of a material that is softer than the work. In this way, the abrasive tends to embed in the lap. Excellent results are obtained from cast iron, which should be soft, close-grained, and free from porosity or other surface defects. Laps are made of steel, however, for thread lapping and of brass or copper for small holes where cast-iron would be too brittle. Lead, type metal, aluminum, babbit, and tin also are employed for special applications.



Internal lapping can be performed on drillpress. Bushing in die set is lapped for fine sliding contact, precise fit, and to eliminate any deformation that occurred when bushing was pressed into place

HOW DO LAPPING MACHINES OPERATE?

MECHANICAL lapping produces accurate, smooth surfaces in large quantities and at high rates of production. Quality in general is superior to that obtainable by hand methods and, in many cases, mechanical lapping attains parallelism, straightness, and uniformity of size that cannot be equalled by any other process. It is chiefly because of the development of mechanical methods that lapping is practical for wide-spread application in the manufacture of precision parts.

Two-Lap Machines

Pieces on which two surfaces must be lapped parallel are done in vertical-spindle machines with two laps. Cylindrical parts also can be lapped in the same machines. One typical unit operates with loose abrasive, and its laps are heavy cast-iron rings mounted parallel one above the other. The lower lap rotates, but the upper does not. Parts are placed between the two, with the upper lap resting on the work. This lap floats on the spindle, so its relative horizontal position is determined by its contact with the work. Pressure is determined by the weight of the lap and that of the work itself. Additional weight can be added, if necessary. A suitable workholder guides the parts and insures their taking the proper motion path across the surface of the laps. As loose abrasive is the cutting agent, the machine is best suited to the harder materials.

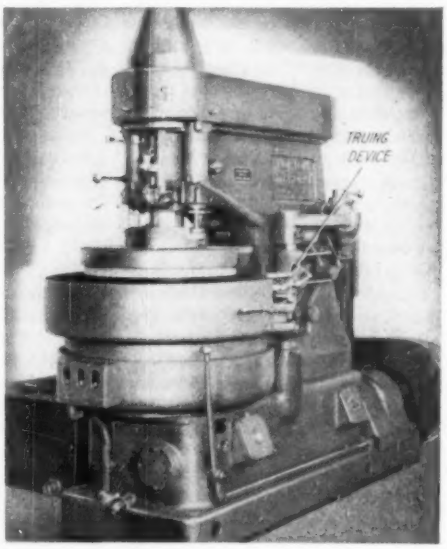
Another machine that can do much the same work as the machine just described, and, in addition, can lap soft metals, is a machine with two parallel abrasive laps. This machine has the added advantage of producing a surface that is clean and bright. Parts are not covered with a thin film of abrasive, as is the case when parts are lapped with loose abrasive, and a cleaning operation thus can be eliminated. Lapping time is about one-third that with loose abrasive and accuracy and finish are excellent.

Surface finishes between 3 and 8 micro-inches rms are practical, as well as tolerances from 0.00005 to 0.0001 in. for parallelism and from 0.0001 to 0.0005 in. for thickness or diameter. Mineral seal oil is recommended as a coolant for flat work and a water coolant with soap flakes for cylindrical pieces.

On these machines, both laps rotate. This permits truing the laps conveniently. A diamond truing device on the machine trues both wheels simultaneously. Laps also can be cut to any width to suit the product—a feature that is particularly important in lapping cylindrical pieces. The upper lap does not float and pressure can be controlled hydraulically. Work holders are identical with those for the machine with cast-iron laps. The machine will accommodate work from ¼ to 2 in. in diameter and from 2 to 7.5 in. long. Flat work from 1/16 to 3 in. thick and up to 6×6 in. area can be done.

Principles of Operation

These machines are based on fundamental principles that distinguish lapping from other processes and account for its ability to produce surfaces that are highly accurate for flatness, parallelism, and size. Probably the most important of these is the relative movement between the work and the lap. During one cycle, every piece in the workholder contacts every square inch of working surface on the lap. In addition, each piece moves over a fresh path without pattern on every inch of its travel. Thus, perfect "break-up" of the motion path is achieved. This is important for two reasons. First, the accuracy that can be obtained in the work depends upon the accuracy of the lap. "Break-up" equalizes lap wear and helps maintain the accuracy of the lapping surface. Second, lapping usually follows grinding, and eliminates surface roughness created by the grains of the wheel and by the undulations and irregularities of the grinding machine or method. Correction of these defects requires an entirely different action from that by which they were created. "Break-up" is one way in which lapping meets this requirement. It is the ideal action both for eliminating minute hills and valleys left by grinding and for producing a surface that is entirely free from feed marks. The extent of the "break-up" and the way in which



Machine with bonded abrasive laps is extremely versatile, lapping either flat or cylindrical work in hard or soft metals. Both laps rotate in opposite directions and can be reconditioned by passing diamond truing device across their surfaces. Workholders are same as for machine with cast-iron laps

it is accomplished is not the same on all machines or even on the same machine. It varies with the job, the machine, and the workholder. In general, however, the more precise the tolerance limits that must be held, and the better the finish that must be produced, the more complete the "break-up" should be. Other features of the cutting action that aid in obtaining accuracy are these: pressures are relatively light, speeds are moderate, and little or no heat is generated during the process.

Work Is Not Clamped

Another major reason why lapping can correct errors from preceding operations is that the work is not clamped while it is lapped. Workholders guide the work but exert no holding force. The work is free to take its natural position on the lap and is not restricted in any way. Distortion from previous operations can be eliminated readily and there is little danger of additional distortion during lapping. Further, as both surfaces of a flat piece can be done simultaneously, parallelism is assured.

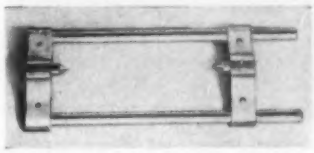
It is essential, however, to lap pieces in multiple. At least six pieces should be done each cycle, and preferably 28, 30, or as many as the machine will hold. With a large number of pieces, chance distributes pieces that are on the high tolerance limit fairly evenly around the lower lap. The upper lap then floats in a plane closely parallel to that of the lower lap, or, if the machine is one in which the lap does not float, the pressure of the cut acts against the lap in a much more even manner. This condition aids in maintaining lap accuracy.

Size Is Closely Controlled

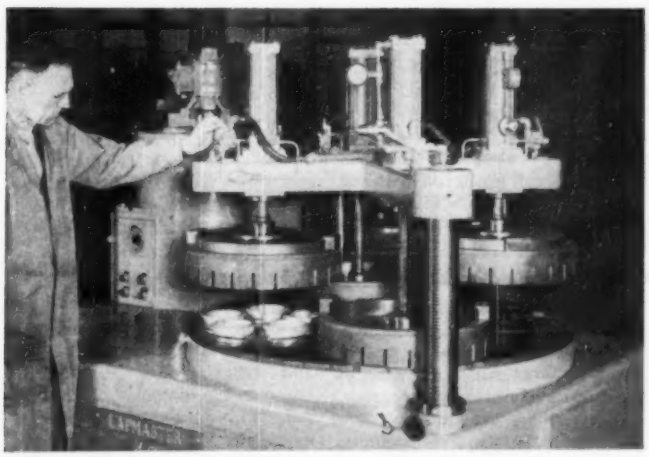
In multiple-part lapping, pressure initially goes on those larger pieces in contact with the lap and cutting action is rapid. As the pieces clean up and the work approaches greater uniformity of size, the laps act on larger areas, unit pressure goes down, and cutting action is slower. It is this characteristic that makes possible extremely close control over the size of the product. Parts are uniform in size, with errors in flatness and parallelism eliminated from flat work, and errors in diameter and straightness eliminated from cylindrical parts. Certain out-of-round conditions, however, cannot be corrected on a machine with flat laps.

A comparison of the two machines just described brings out the following major points: the machine with the bonded abrasive laps is much more versatile than that with the cast-iron laps, because soft materials as well as hard can be done on bonded abrasives; reconditioning the abrasive lap is faster and easier; and the production rate with bonded abrasive is about three times that with loose abrasive. However, because the bonded abrasive lap has a much more rapid cutting action, it is not possible to obtain the closeness of control over the operation that is possible with loose abrasive. Hence, the machine with bonded abrasives cannot consistently hold on a production basis tolerances quite as close as those regularly held on the cast-iron lap machine.

Single-lap machine of this type is intended for manual work application



Workholder has adjustable centers to support cylindrical parts on single-lap machine

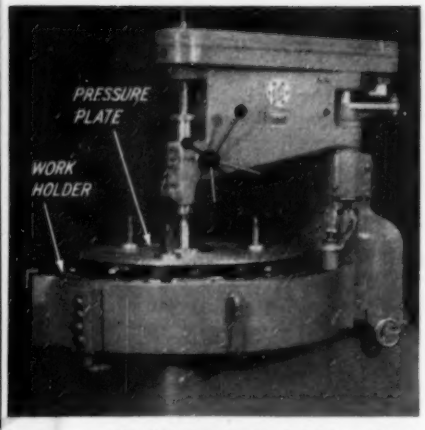


Single-lap machine for production work has large rings that provide continuous reconditioning action to maintain lap accuracy. Rings also provide uniform distribution of compound, which is fed continuously. Pressure plate floats in ring and rests on work. Both plate and ring are lifted by pneumatic cylinder

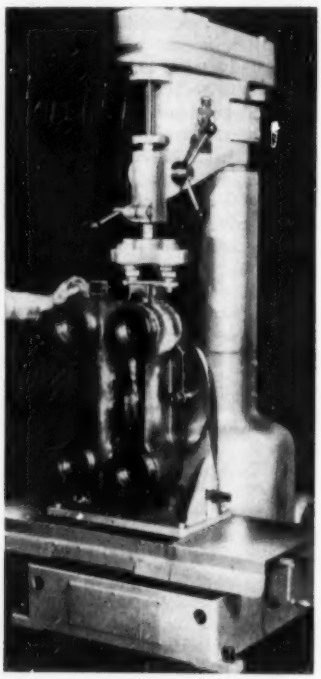
Single-Lap Machines

Pieces on which only one surface needs lapping can be processed on vertical-spindle machines with one horizontal lap that is power-rotated. Lapping can be performed either with loose abrasive on a cast-iron lap or with a bonded abrasive wheel. The latter requires a truing device and coolant supply on the machine. Machines are made in several sizes with plates from 10 to 72 in. in diameter and speeds ranging from 200 to 800 fpm.

Work can be held against the lap manually and, in this case, the procedure is much the same as for hand lapping. This method often is selected for irregular-shape parts



Bonded abrasive lap finishes surfaces of irregular-shape parts on single-surface machine. Machine has diamond truing device and coolant system. Plate assembly applies pressure to pieces in workholder



Recessed flat surfaces can be finished by special machine imparting oscillating motion to lapping plate that has appropriate shape for the job. Lap speed is slow and abrasive extremely fine to obtain high surface finish. Oscillation breaks up the motion path

that require manipulation to apply pressure in such manner that even lapping results.

In many cases, parts can be held in workholders, eliminating the need for the operator moving them over the lap and increasing the capacity and flexibility of the machine. Workholders permit lapping the maximum number of parts at one time, as the capacity of the workholders is limited only by the size of the machine. Workholders also permit lapping more than one job at the same time, as different sections of the holder can be made to take different parts. The abrasive must be satisfactory for all, however. Parallelism cannot be held, but excellent flat surfaces can be produced, if the lap is maintained accurate. It also is important that the weight of the object is evenly distributed relative to the surface to be lapped.

Non-rotating Lap Machines

Machines with a mechanism that rotates and gyrates the work between two flat, non-rotating laps are advocated for gage blocks and similar parts, especially those that are comparatively tall, yet have a relatively small surface area to be lapped. As the laps are stationary, there is little tendency for the work to tilt. Workholders can be either eccentric-rotary-driven or planetary, as will be explained in a later section.

Spherical Lapping

For spherical surfaces, the lap is a counterpart of the surface to be finished. In one method, the lap is attached to the ball end of a crank pin on a vertical-spindle machine. When the work is aligned with the centerline of the spindle, rotation causes the lap to slide around the work.

Oscillating Spindle Machines

Lapping is primarily a method obtaining dimensional accuracy. Refinement of surface normally comes automatically as a part of the process of obtaining accuracy. However, there are times when a part is satisfactory dimensionally, yet the finish is not all that is desired. For such conditions, a machine with an oscillating spindle is available. This machine also is suited to pieces that can be handled better individually than in multiple.

The principle is to rotate the work slowly while it is held in contact with a slowly rotated lap and, at the same time, to oscillate the spindle on which the work is chucked. The oscillation provides the required "break-up" in the motion path of the work relative to the lap.

The lap should be perfectly flat and its face should equal the diameter of the work. Pressure is very light, often only the weight of the spindle. Lap speed is as slow as 10 to 15 sfpm and work speed ranges from 100 to 200 rpm. The abrasive is extremely fine. For example, hardened steel may be lapped with a 1200 grit or finer. The method is intended for parts that must be extremely flat with a high surface finish such as is required for optical flat measurement.

Center Lapping Machines

Grinding between centers to close tolerances requires that the centers themselves are accurate. Any distortion, such as may occur in heat-treatment, must be corrected if precision is to be reached in roundness, straightness, and concentricity, not only in grinding but also in subsequent lapping operation.

Center lapping reconditions work centers by bringing them to the shape of a correctly formed abrasive lap mounted on a steel shank. The lap is chucked in a drillpress and the piece is held vertically on a fixed center that is accurately aligned with the point of the lap. The lap rotates about 2400 rpm and is trued frequently with a diamond. The operation usually is performed dry with an oil-treated lap.

Crankshaft Machines

The lapping of journals on crankshafts and camshafts can be done by hand with compound and hinged hard wood strips bored to the diameter of the journal. On a production basis, however, the operation is done in machines developed particularly for these products (*AM*—Apr. 12 '45, p107-111.) Split shoes, bored to size, are carried by movable

arms that are pivoted to follow the movement of the cranks. The shoes contain a liner of coated abrasive and act simultaneously on all journals. Shafts reciprocate and rotate during the operation.

Gear-Lapping Machines

Slight inaccuracies in tooth profiles, spacing, and lead and minor distortion from heat-treatment can be eliminated from gears by lapping with loose abrasive on cast-iron laps (*AM*—Mar. 20 '50, p115-116). However, as lapping primarily is a refining process, only reasonable errors can be corrected without increasing lapping time excessively. Basically, work and lap rotate together and, at the same time, the work reciprocates across the face of the lap. On some machines, the axes of the work and lap are parallel; on others, they are crossed. Through these methods, a more uniform lapping action is obtained over the entire tooth form and the action can be controlled to provide the corrective effect that is required.

WHAT IS THE CUTTING ACTION IN LAPPING?

LOOSE abrasive can be either intermittently applied or continuously fed. When intermittently applied, the abrasive mixture is brushed on the lap sparingly and at random. It also may be applied to the work. As the lap rotates, grains roll between the lap and the work, with some grains becoming imbedded in the surface of the lap by the high spots on the work. As these spots wear down under the action of the embedded grains, other areas of the work come in contact with grains and press them into the lap. This process continues until the lap becomes fully charged. In this method, the majority of the work is done by the embedded abrasive. As grains wear, the effects show on the product. When the normal lapping cycle fails to bring the work to size, abrasive should be added. On the other hand, if the finish is not as good as required, more oil is needed.

Continuously Fed Abrasive

In continuous feeding, the abrasive mixture flows steadily across the face of the lap. As grains roll between the work and the lap, some become imbedded in the lap. But as long as there is an excess of free grains on the lap, the imbedded grains do little work and most of the cutting action comes from the rolling abrasive. Stock removal proceeds at a faster rate with free abrasive, and a fine finish can be obtained. In general, however, the more free and mobile the abrasive is, the more cloudy the finish will be. If a bright finish is required, the flow of abrasive is stopped as the work approaches size. The imbedded grains then come into action to produce the desired finish. For an optically flat surface, there should be no free grains rolling between the lap and the work. With either method, it is extremely important to have uniformity in grain size.

Selection of Abrasive

The selection of the abrasive is influenced primarily by the material of the product and its hardness, the total amount of stock removal (thickness × area), and the final finish required on the work. Hardness indicates the kind of abrasive, as the hardness of the abrasive must equal that of the work. The area of the surface is a guide to the grain size needed. In general, the greater the area to be lapped, the coarser the grain may be. This is true because total stock removal is greater and gross errors in the work are larger; and also because large pieces tend to break down the grain during lapping. Small parts, on the other hand, can be done with smaller grain. These considerations, however, must be weighed in relation to the finish required on the piece. Fine finishes require a fine grain. Yet, if finish is not critical, a coarser grain can be specified, with greater output as a result.

Once the abrasive mixture or wheel has been selected, the rate of metal removal depends upon the pressure and the amount of free abrasive present. An increase of either pressure or free abrasive speeds the cutting action. However, care must be exercised to avoid scratches in the work and to avoid lapping so fast that control is lost. If the area of the part is small, geometric accuracy may be destroyed by lapping too rapidly.

Diamond abrasives find wide application for lapping tungsten carbide. Typical parts include cutting tips, bushings, and die sections. Excellent results also can be obtained on steel, but, because they are lower in first cost, silicon carbide and aluminum oxide normally are selected for steel parts. These two abrasives also are satisfactory for nearly all types of lapping. Emery and natural corundum produce good finish but are slower cutting. Quartz and garnet, though fairly hard, break down rapidly. Softer abrasives seldom are used.

Vehicles for the Abrasive

Abrasives are manufactured in a range of sizes from 120 screen to superfine flours. During lapping, abrasives are suspended in a vehicle that keeps the grains separated and also lubricates the work and prevents scoring. Vehicles include oil, grease, soap and water. For machine-lapping hardened steel, oil or an oil-base liquid usually is selected. Grease is suggested for the softer metals.

Commercial lapping compounds are available in which grit size and uniformity are controlled to varying degrees. These contribute to greater consistency in lapping results, as users can settle on a standard mixture.

Pressure in lapping varies from ¾ to 10 lb/sq in. depending upon the product. Soft metals, such as die-cast aluminum, require only light pressure up to about 2 lb/sq in., while the harder metals are lapped in the range from 2 to 10 lb/sq in.

WHICH WORKHOLDER WILL DO THE JOB?

THE prime requisite for successful lapping is an accurately flat lap. Leaving the manufacturer's plant, the lap is nearly perfect. How well its accuracy is maintained then depends primarily upon the motion path of the work as it moves across the face of the lap during the operation. The ideal condition is perfect "break-up." How closely this condition is approached on any given machine depends upon the workholder that is supplied for the job. One of the most important points in planning a lapping operation, therefore, is to provide workholders that act to prolong the accuracy of the lap.

Single-Lap Machines

On the single-lap machine, floating adjustable workholders are satisfactory for many small pieces. Work is retained by a cast-iron or steel wear ring which rests on the lap and which can be moved to various positions on the lap surface. Adjustment is made through a cross-piece assembly that mounts in an elongated slot in an upper support member. The position of the wear rings is adjusted inwardly or outwardly, as indicated by experience, to correct any condition of wear that develops in the lap surface. Parts are guided by adapters within the wear ring, with the motion of the lap causing the parts to rotate about the axis of the adapter. Pressure can be controlled closely by placing weight upon the work. Small or light pieces of the same cross-section crawl around nicely within the wear ring and lapping action is good. Heavy pieces may not crawl but can be power-rotated. Toothed workholding rings, driven by a central gear, cause the work to rotate on its own axis.

On the single-lap machine, the workholder as a unit normally cannot be rotated. Therefore, as the only rotation is that of the work itself, it is particularly important that the work cover the entire surface of the lap. This can be arranged readily with large pieces. Small pieces, however, cannot extend far off the edge without falling from the lap. Therefore, a wear ring is employed to cover the entire surface and provide the desired wear effect. This procedure succeeds so well that one manufacturer whose machine setups are based on the wear-ring principle claims that the lap on his machine is continuously self-reconditioning.

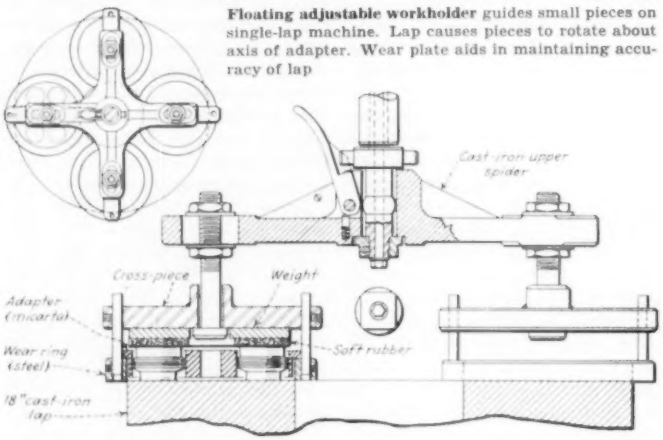
Many irregular-shape pieces can be lapped mechanically on single-lap machines. Weights are added to equalize the off-center distribution of weight in the product and to bring the center of mass central with the lapped surface. Similarly, if a piece contains inserts of hard material, weights can be added to achieve uniformity in lapping action.

Two Laps—Flat Work

The majority of workholders for flat work on two-lap machines fall into two categories; plate and two-piece. The plate workholder is circular and has equally spaced openings in which the work is placed. The holder rides just above the lap and is rotated by three pins in an eccentric drive at the center of the machine. The resultant motion path of the work in the holder is a "moving square" and, on some machines, is continuously changing for as many as several thousand revolutions before it repeats. Superimposed upon this motion is the rotation of the piece within the holder. The result is the "break-up" required for correct lapping.

Openings in the holders may contain an individual piece, if the piece is of large diameter, or an insert, which in turn, accommodates several small pieces. Holders are made of micarta unless the work requires a thin section, in which case steel is selected. Plate holders are employed for large diameter rings or plates and for such work as naturally fits a wide-face lap.

For certain pieces, however, it is desirable to shape the aperture to the work to prevent the piece from rotating within the holder. This sometimes is done on parts made of soft metal when the random scratch pattern is unsatisfactory. It also is done, if pieces are rectangular or out of balance, to prevent excessive lapping on some areas of the surface. However, when the work is not large enough to cover the face of the lap, the openings in the holder must be arranged in a spiral or some other stagger pattern in which the work covers the entire lap progressively as the holder rotates.



Floating adjustable workholder guides small pieces on single-lap machine. Lap causes pieces to rotate about axis of adapter. Wear plate aids in maintaining accuracy of lap

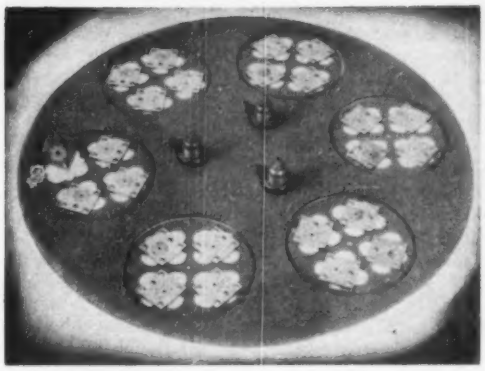
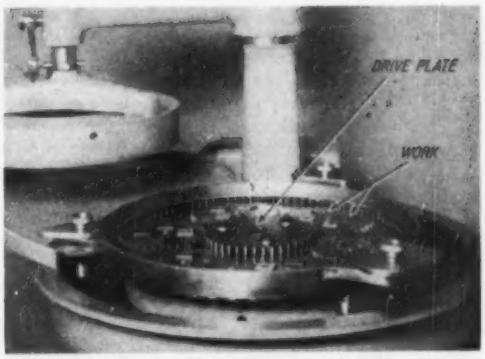
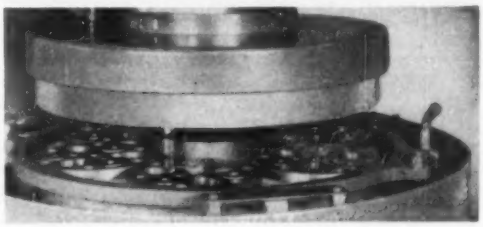


Plate workholder guides motions of flat pieces on two-lap machines. Large pieces are placed in openings individually. Small pieces require an adapter



Two-piece toothed workholder provides planetary and oscillating motion to work in retainers. Central drive plate is rotated by three pins in eccentric drive unit of machine. Outer ring does not rotate

THESE WORKHOLDERS ARE FOR FLAT WORK ON TWO-LAP MACHINES

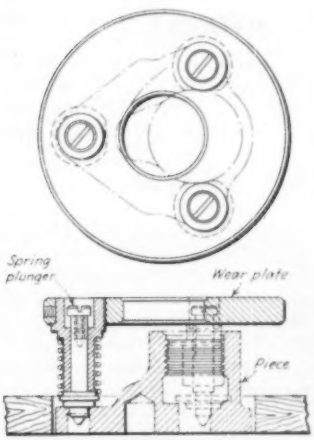


Two-piece frictional workholder has same motion as toothed holder except for slippage. Split outer ring is closed by eccentric link to hold work retainers against central drive plate

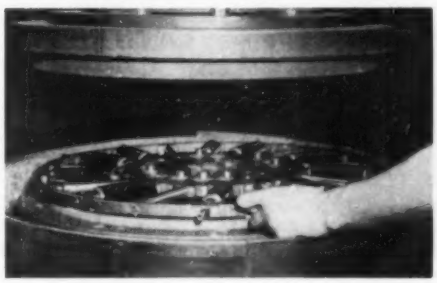
Two-Piece Workholders

The two-piece workholders are either toothed or frictional. The toothed holder consists of work retainers arranged in a planetary manner around a central drive plate and held in mesh with the drive plate by a non-rotating outer ring. The drive plate is rotated and gyrated by three pins whose rotation is eccentric to that of the lap. This causes each retainer to rotate about its own center, as well as the center of the drive plate, and, at the same time, to move radially back and forth across the face of the lap. In addition to these controlled motions the individual pieces in each retainer creep around their own axis during the operation. Thus perfect "break-up" of the motion of the work relative to the lap is obtained.

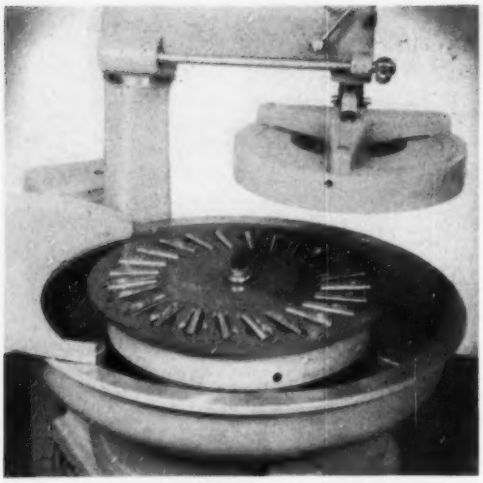
The frictional workholder contains the same basic elements but none are toothed. The outer ring holds the work retainers in frictional contact with the central drive plate. The ring is split and has an eccentric link arrangement to provide the necessary pressure between the retainers and the drive plate. The frictional workholder provides the same cycloidal motion path as the toothed holder except for the effect of slippage on the frictional driving surfaces.



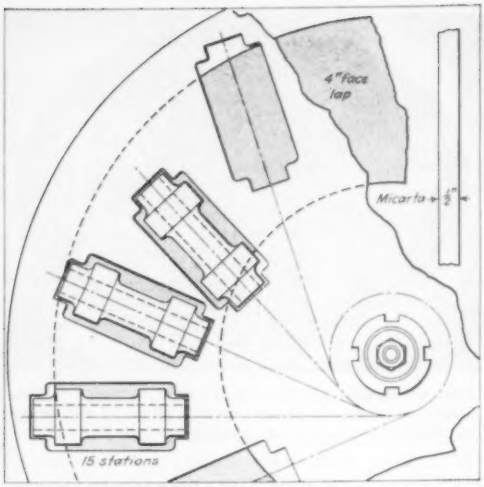
Pressure-plate unit contains three spring-loaded plungers that equalize pressure on irregular shape work of upper lap which bears on wear plate. Each adapter guides three pieces, each with wear plate



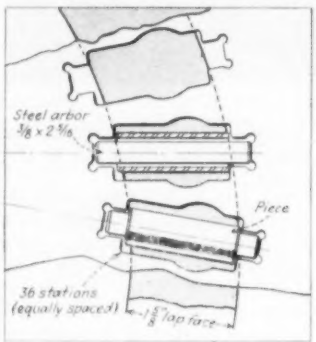
Spider workholder is for tubular pieces that can fit loosely on legs of unit. Loaded holder can be placed in or removed from machine intact



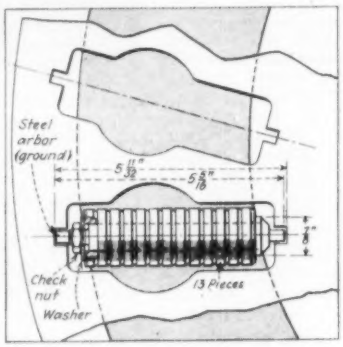
Conventional plate workholder guides work from trunnions on each end of piece. Centerline of each opening is tangent to circle at center of plate. Width of lap is equal to length of work



Staggered openings are required in plate workholder if lap width is greater than length of part. Openings are arranged so pieces cover entire face of lap progressively

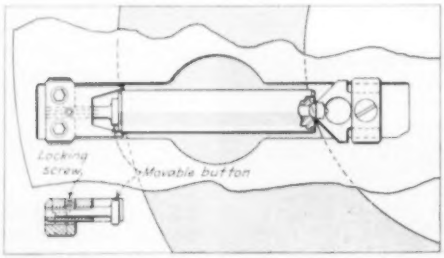


Inserted arbor provides guiding surfaces for cylindrical piece with through hole. Arbor is about 0.005 in. smaller than hole diameter

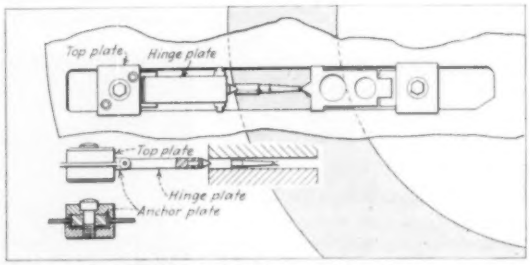


Built-up cylinder consists of 12 pieces securely clamped on arbor. Method is for pieces too narrow to be done individually. Faces of pieces should be lapped previously

CYLINDRICAL WORK CAN BE DONE IN THESE WORKHOLDERS FOR TWO-LAP MACHINES



Adjustable workholder has button that can be set to correct position so work does not bind in guiding V-groove. Set screw holds button in position



Center-guide workholder guides small gage from two centers mounted in hinged plates so work can rise and fall without restriction

However, wear occurs and any out-of-round condition reduces the driving pressure on the retainer. Therefore, as the toothed holder provides a positive drive, the trend is toward this holder in preference to the frictional.

The two-piece workholder is the most effective unit for close-tolerance work. By moving the work at a steady rate over the entire surface of the lap, it overcomes the effect of a differential in peripheral speed from the inside to the outside diameter of the lap. Part rotation within the adapter is regular regardless of slow and fast-speed areas on the lap.

For irregular-shape pieces that are to be lapped flat on one surface in a two-lap machine, pressure-plate units are required. The unit illustrated is for either plate or two-piece workholders. If employed on a machine designed for abrasive laps, a very fine, hard wheel is mounted in the upper-lap position to provide the required pressure.

Two Laps—Cylindrical Work

Workholders for cylindrical parts differ considerably from those for flat surfaces. The workholder positions the parts so their longitudinal centerline is off the radial centerline of the lap and is tangent to a small circle around the center of the workholder. The amount of the angle affects the finish obtained and can be from 10 to 20° off radial, depending upon the part. As the laps rotate, the work rolls between them, with some slippage introduced because of the angular position of the piece. A third motion of sliding across the face of the lap is provided by the workholder. The workholder is bushed at the center and is mounted on a pin that is eccentric with the lap. The pin may be stationary or it may be rotated slowly, depending upon the machine. In any event, the eccentricity of the sliding motion should be such that the work can override the inside and outside edges of the lap. The amount of overtravel can be quite short and should not be more than one-third the length of the product. In cylindrical work, the width of the lap should be identical with the length of the product. If this is not possible, the workholder should be made to stagger parts to cover the entire surface of the lap progressively.

Workholders are either spider or plate, with the latter the more versatile of the two. The spider holder is applicable to hollow cylindrical parts when it makes no difference if the surface of the hole becomes marred through contact with the leg of the holder. The holder originally was designed for automobile wrist pins and seldom is selected for any other part.

Plain Workholders

The plate holder is made in several varieties each of which is intended for a given class of work. A major requirement is that the workholder should guide the work without touching the lapped surface. Thus, pieces that have trunnions, undercuts, shoulders, or other suitable surfaces that are not lapped are placed in apertures shaped to guide the piece from these features, yet leave ample clearance around the lapped surfaces. If pieces have no suitable contact surfaces but are hollow, they can be mounted on a close-fitting steel arbor and guided from the ends of the arbor. Some pieces, however, are too narrow to be lapped individually by this method. These can be clamped securely on an arbor to form a cylinder that is three to four times as long as the piece diameter.

Adjustable Workholders

Adjustable and center workholders also are made. The former are for pieces in which there is no center hole or the hole does not go through. The latter are for parts with centers but no other possible guide surfaces. Centers are hinged, as holders must not restrict the work if straightness is to be obtained. The center is mounted on a section which is flat enough to go between the two laps without touching them.

Parts with a shoulder on one end can be lapped successfully, provided there is an undercut between the end of the lapped surface and the shoulder. The undercut should be long enough to permit some reciprocation of the work across the lap without interference by the shoulder on the periphery. It also is preferable to make the workholder adjustable so correction can be made for any tendency to lap taper because of the restricted stroke.

WHAT CAN CENTERLESS LAPPING DO?

CENTERLESS lapping usually is a high-production method of lapping straight round parts on a continuous, thru-feed basis. It often follows centerless grinding in which no more than 0.0005 in. stock is left for removal by lapping. Surface finishes of 2 micro-inches rms can be obtained and tolerances to 0.000025 in. for roundness and straightness and 0.000050 in. for size can be held. Parts that can be done by this method include straight roller bearing components, wrist pins, pistons, valve tappets, shafts of all kinds, and pump, injector, and hydraulic plungers.

Machines have an abrasive lapping wheel and regulating wheel, and are similar in appearance to centerless grinders. However, the wheels have a much greater face width (usually 22 in.) to provide longer contact with the work and each is swiveled in the opposite direction in parallel vertical planes. For average work, the lapping wheel is adjusted to a negative angle of about four degrees and the regulating wheel is adjusted to a positive angle of from one to three degrees, depending upon production and finish requirements. When trued, the wheels have a slight "hour glass" shape and the line of contact of the wheel is at an angle to the axis of the work. Then, the grains of the wheel cut across the work at an angle to the scratch pattern produced in grinding. In this way, a "wrap-around" action results and axial chatter marks

from the grinding operation are removed.

Wheel speed has an important bearing on finish obtained. Speeds are generally low, ranging from 400 to 1000 sfpm for the lapping wheel, and from 250 to 400 sfpm for the regulating wheel, on machines with a variable speed motor. In general, lapping wheel speed is reduced and regulating wheel speed increased to obtain a better finish.

Three-Step Operation

For the finest finish, three operations, with progressively finer wheels, are required. The first is performed with an aluminum oxide vitrified wheel, which removes from 0.0004 to 0.0007 in. and provides a finish from 4 to 6 micro-inches rms. A very fine, medium-hard, resinoid wheel of silicon carbide is selected for the second operation. No more than 0.00005 to 0.0001 in. is removed and a finish of 2 to 3 micro-inches rms is obtained. The third operation usually is performed with a 500 grit wheel. Metal removal is insignificant, finish is improved.

During the first operation, work is supported on a steel blade or one faced with cemented carbide. Hard rubber can be selected for the second operation and softer rubber for the third. Micarta or other material that is hard enough to wear well, yet soft enough so it does not become charged with abrasive as it drops from the wheel, also is satisfactory. Charging must be prevented to avoid scratches on the work. Normally, the piece is positioned slightly above center in the first lapping operation. This tends to correct any condition of "three-lobe-out-of-roundness" that may be present from the grinding operation. Some chatter may occur, but the second and third operations are performed on center and eliminate the effects. With the proper work rest, pieces up to 6 in. in diameter can be lapped and bars no greater than 3 in. in diameter can be done in lengths up to 15 ft.

Cleanliness is extremely important and a full flow of clean coolant is required. Water plus a small amount of freely dissolving soap flakes plus a very little soda is recommended as the coolant.

Single-Piece Machine

Another type of centerless lapper consists of two parallel cast-iron rollers employing fine, loose abrasive. Rolls are mounted horizontally and the lapping roll is much larger than the regulating roll. Both rotate in the same direction and at the same rpm. Work revolves between them at the speed of the regulating roll and the operator controls the lapping operation by moving a notched fiber stick over the work. Pressure can be applied where desired and taper, as well as cylindrical work, can be lapped. Intended only for small lots, the machine is capable of finishes to 2 micro-inches or better.

ACKNOWLEDGMENT

We are grateful to all who aided in the preparation of this report, and particularly to H. B. Indge, lapping engineer, Norton Co., for his counsel on many of the technical aspects of the subject. We also appreciate the cooperation of the following companies in supplying material for the report:

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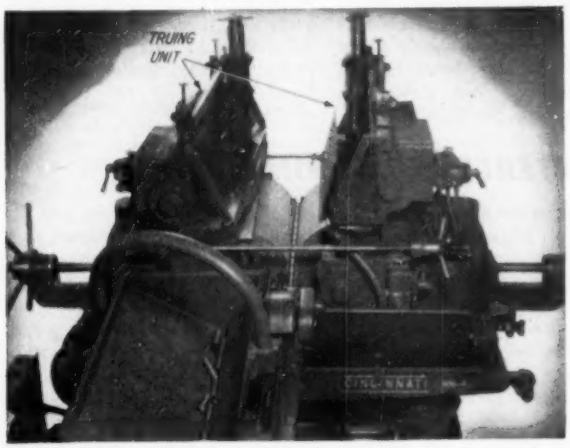
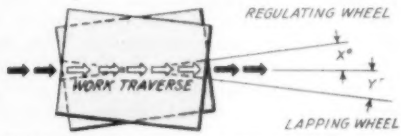
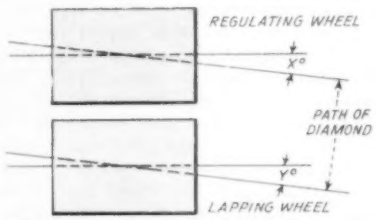
Danly Machine Specialties Inc.
Ex-Cell-O Corporation
The Fellows Gear Shaper Co.
C. Allen Fulmer Company
The Gardner Machine Co.
Michigan Tool Co.
Micromatic Hone Corporation
National Broach and Machine Co.
Norton Company
The Shauer Machine Co.
The Taft-Pierce Manufacturing Co.



Centerless lapping machine finishes straight round work at high rate of production. Wheels are tilted vertically in opposite directions and are trued to mild hour-glass shape. This results in straight-line contact of lapping and regulating wheel to work



Tilted regulating wheel causes work to move through machine. Lapping wheel is tilted to improve finish. Because of tilt . . .

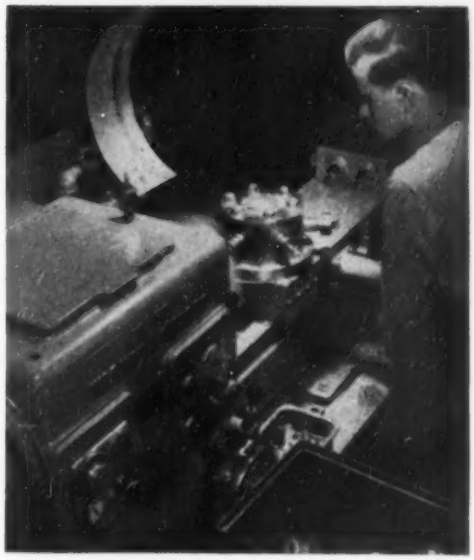


Truing operation must make wheel slightly hour-glass so contact with work is maintained for full length of wheel. Truing device moves in plane parallel to tilted axis of wheel and is swiveled same number of degrees as tilted axis

HOW TO GET THE MOST OUT OF TURRET LATHES

Turret-lathe efficiency depends not only on the machine itself but also on teamwork between shop and office personnel. This means preplanning, for without preplanning, the flexibility of the machine may tempt its user into cutting practices that sap its profit-producing potential. Here are eight fundamentals of turret-lathe practice which the *user* must observe so the *machine* can produce effectively

BY E. L. MURRAY
The Warner & Swasey Co., Cleveland, Ohio



Automatic control panel takes over many manual operator functions on this chucking turret lathe. Because of its fatigue-reducing characteristics, machines of this type are well suited to jobs with large proportion of handling to cutting time in the over-all machine cycle

1.. *MATCH THE JOB AND THE MACHINE:*

Jobs may be too simple or too stringent for the turret lathe. Such jobs dissipate profits rapidly. Jobs involving simple drilling and facing may be handled well enough on a drillpress with a smaller overhead rate. On the other hand, grinders, tapping machines, thread millers, and precision boring and turning equipment hold limits of tolerance and finish beyond the capacity of the turret lathe for work required in production lots. Tolerances to 0.0005-in. and finishes to about 15 micro inches rms may be handled by the well-conditioned horizontal turret lathe. Limits beyond these exceed the normal capacity of the machine to produce large quantities efficiently.

What effect has the size and type of job on the size and type of turret lathe selected? The modern concept of machine selection considers metal-removing ability *and* maneuverability as true gages of job placement. Yet, collect capacity or swing over the bedways may mislead the user into scheduling jobs according to dimensional capacity.

For instance, is it true that a 2-in. bar which must be reduced to ¾-in. diameter in one pass belongs on a turret lathe with a 2-in. collet chuck? The turret-lathe user may readily agree that a machine with a 2½- or 3-in. collet chuck and greater metal-removing capacity will produce the work at less cost than the smaller turret lathe. This is true if there are enough savings in production to overcome the higher cost of the larger machine. Calculations usually are necessary to evaluate this relationship.

Another consideration is the ratio of handling time to cutting time for different jobs made from different materials. For example, the average production cycle of small-to-medium-size brass castings may contain 80% handling time and 20% cutting time. And certain cast-iron and steel jobs may have 30 to 40% handling time against 70 or 60% cutting time. Consequently, machines are available with semi-automatic control features that transfer certain functions of manual handling to the automatic control panel. Production increases of 25% for iron and steel jobs and 300% for brass jobs have been possible through the application of this type of machine control to suitable work requirements.

In any event, matching of job to machine is of vital importance in establishing the basis for all other factors in good turret-lathe practice.

2.. *KEEP THE MACHINE IN CONDITION:*

A machine cannot operate at low cost if it is not in condition. The need for major overhauls and reconditioning is recognizable and ordinarily satisfied without delay. The advantages of routine maintenance are not so readily appreciated. For example,

accuracy in turret-lathe production is a direct function of machine alignment. Maintenance of alignment is fundamental to turret-lathe practice and, properly attended to, reduces undue wear in toolslides and minimizes taper boring and turning.

Headstock and feed clutches must be in proper adjustment if available power is to be transferred to the cutter and wear on clutch plates minimized. Turret binder clamps are adjustable and must be kept in adjustment to preserve accuracy and the ability to withstand heavy cuts.

Square and hexagon turrets should be checked periodically for index accuracy. If required, the lock bolts may be replaced to restore original machine performance.

Toolslides ordinarily are equipped with gibs which must be in adjustment so slides progress under feed in a uniform manner. As with turret binder clamps, this helps maintain accuracy and promotes metal-removing capacity.

V-belts between the main drive motor and drive shaft must be in condition and properly adjusted to transfer power to the headstock effectively.

Spindle bearings must be in proper adjustment if chatter and poor finish are to be controlled. Adjustment normally is not complicated, although users may request assistance from turret-lathe manufacturers when required.

Cleanliness on and around the turret lathe is of prime importance. The turret-ram slide and cross-slide of the machine should be removed and cleaned periodically. Workholding devices also should be disassembled, cleaned, and lubricated regularly if accuracy is to be maintained.

It is of course axiomatic that a planned schedule of routine lubrication for the entire machine should be maintained according to the turret-lathe manufacturer's recommendations.

3.. ELIMINATE PRODUCTION DELAYS:

As with other machine tools, the turret lathe produces profits only when it is running. In some cases, down-time is excusable, but in most cases the various influences on machine performance which establish its net operating day should be inspected closely.

For example, the job always should be at hand near the machine before the job currently on the machine runs out. Frequently a "utility man" in the department may be charged with this responsibility. When the foreman assigns the next job to a given machine, the utility man has advance notice that bar stock is to be ordered or castings moved to the machine prior to the operator's need for the material.

In like manner, tools for the next job should be available in advance. Many turret-lathe departments have a "tool selector," who may be a former setup man, check the advance schedule board and make sure that all cutters, fixtures, and tools are next to the machine along with the raw material. This prevents delay between tearing down the current setup and beginning the next job. Depending on the tool selector's qualifications, such a man may be invaluable in helping the foreman advise operators on speeds, feeds, arrangements of tools where setup cards are not available, and similar problems.

Some delay in machine operation may arise from disputes between inspection and the shop concerning the nature of work specified on the blueprint. If tolerances, finishes, and concentricities are not specified exactly, then there is no common ground for cooperation between inspection and production. This may lead to endless discussion concerning the acceptability of the work, during which time the machine may not be in production.

When possible, such routine processes as chip disposal, lubrication, and minor adjustments should be scheduled for lunch hour, second shift, or other slack production periods.

When all details are under full control, the foreman can devote more of his day to supervision and job scheduling. This is essential to full production.

4.. SELECT AND MAINTAIN CUTTING TOOLS PROPERLY:

Despite the prevalent use of carbide cutting tools on horizontal turret lathes, opportunities arise which justify the selection of high-speed steel and cast alloys. Turret-lathe setups should be analyzed to determine the cutting material most likely to "lay more pieces on the floor" at the end of a given production period. The application of that material then should be developed fully. In many cases, a combination of two or more cutting materials may be most effective.

An important source of increased productivity is centralized responsibility for the performance and grinding of cutting tools. The importance of this system of control is proportionate to the number of turret lathes in a shop department or plant, and may in some cases represent the difference between low- and high-cost production. A centralized responsibility can accumulate the broad experience necessary for intelligent application of cutters of all

Eliminate production delays — Foreman's booth in Warner & Swasey turret lathe department is control center for some 60 turret lathes. Job cards in rack schedule work to various machine centers in department. Board is part of system that provides tools, bar stock, and castings to each machine in advance of setup

sorts. It also can minimize the number of shapes of tools required and, in the case of carbide, the number of grades necessary. Advantages of this function are similar to those of centralized grinding, which permits cutter sharpening on machines rather than at the turret lathe—more than likely done by hand at that source. As mentioned previously, a secondary advantage of centralized tool control lies in maintaining an adequate supply of sharp cutters on hand in advance of machine needs.

5.. USE THE TURRET LATHE AS A TURRET LATHE:

The horizontal turret lathe originally was designed for mounting tools in an indexing turret so numerous cuts could be taken in rapid succession. The second important design change in turret lathes, made about 35 years ago, introduced a cross-slide which could be fed under power simultaneously with the power-feeding hex turret. The principle of tooling practice behind this design is still as important today as it was 35 years ago. Much of the ability of the turret lathe to produ : at low cost lies in its ability to combine cuts from the cross-slide simultaneously with cuts from the hexagon turret. Whenever this principle is not applied, the turret lathe is not producing at maximum efficiency, and steps should be taken either to retool the job or to transfer it to another machine if it is so simple that combined cuts are not feasible.

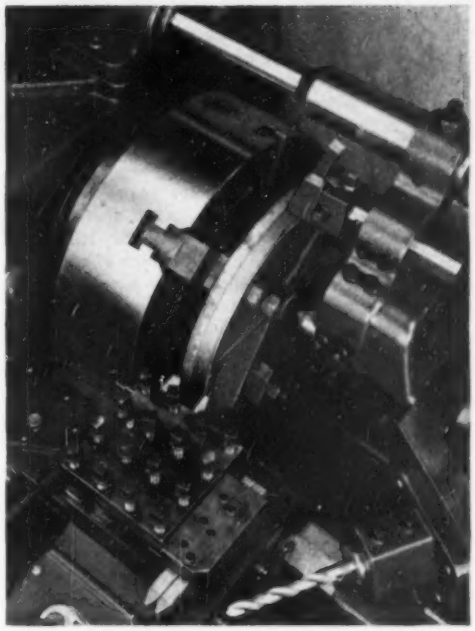
It should be understood that multiple cuts—that is, cutters arranged to operate simultaneously from an individual cutting station—save time and fatigue, as well as promote accuracy, by eliminating the need for operator attention to machine stops.

There is a prevalent tendency among turret-lathe users to perform an excessive amount of turning, chamfering, and like operations from the cross-slide of the machine, at the same time limiting the hexagon turret to centerline work such as drilling, boring, and reaming. It can not be emphasized too strongly that the primary function of the cross-slide of a turret lathe is to combine cuts with the hexagon turret or to perform cutting operations *that cannot possibly be arranged on the hexagon turret.*

For example, a turning cut should not be taken from the square turret while the hexagon turret is idle. A better arrangement is to turn from the hex turret with a cutter preset to size in combination with a facing or chamfering cut from the cross-slide. When cuts are set up on the hexagon turret, it is possible to set positive machine stops for those cuts. This not only speeds up the job and reduces operator fatigue, but also maintains fixed cutter-settings such as are not possible with cutters on the cross-slide.

6.. SELECT THE RIGHT DURABLE TOOLS:

In a turret-lathe setup, tools may work satisfactorily to all visible intents, yet obscure changes frequently are possible which further reduce production costs. For example, relatively inexpensive chuck jaws built specially to hold a given casting



Use the turret lathe as a turret lathe—Note combined and multiple cuts. Overhead turning is done in multiple with start-drilling operation from hex turret. Cutters in square turret straddle-face rim of cast-iron fan pulley. Tools in both turrets cut in combination with each other—a basic principle of turret-lathe practice

may permit greater feeds and speeds through more rigid holding.

Most manufacturers of turret lathes offer complete lines of universal standard tooling which can be arranged in a permanent manner on the hexagon turret. Setup or changeover time can be minimized, threby extending the turret-lathe principle into smaller job lots. By the same token, many turret-lathe setups can benefit from the judicious application of special boring bars, work-holding fixtures, cutter blocks, and so on. The rather sensitive relationship between standard and special tooling ordinarily is not judged offhand but requires balancing the costs of production with special tooling against the quantity of pieces to be made to determine whether such tooling is justified or not.

7.. PICK RIGHT SIZE AND TYPE MOTOR:

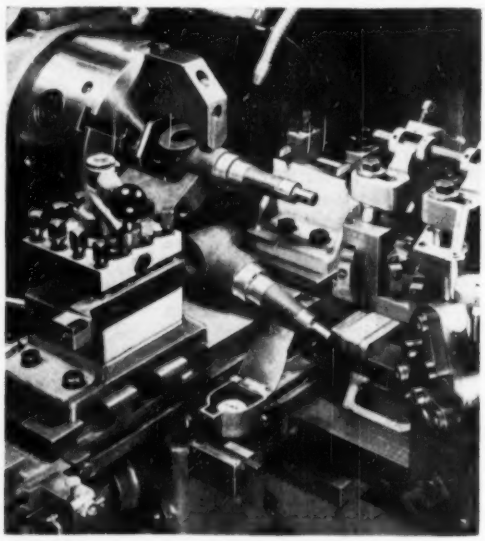
An underpowered machine cannot remove metal at rates consistent with good turret-lathe practice, provided such metal-cutting capacity is required of the lathe, nor can an overpowered machine entirely justify itself if the nature of the work does not require such powering.

Generally speaking, if the turret-lathe user has a large variety of work in small-to-medium quantities which must be machined from a variety of soft and hard materials, it is advisable to equip his turret lathe with a main drive motor which matches

the capacity of the headstock. Although some jobs may not require the power available, there can be times when the maximum capacity of the machine is necessary to do the work satisfactorily.

By the same token, if the turret-lathe user is able to define his work flow over given machines, then the nature of the work may be related more specifically to the size of motor required for the lathe. Frequently it is an advantage to match job power requirements with the motor so the motor will work oftenest in its highest range of efficiency and power factor. Many shops have penalty clauses in their contracts with utility companies. These require that the shop power factor be kept at or above a stated minimum. A general condition of overmotoring in a shop has an injurious effect on the shop power factor and may therefore increase the cost of power.

Turret-lathe headstocks are available in a variety of types—all-geared, direct motor-drive, or automatically controlled. All-geared headstocks, however, which change speeds either by shifting gears or by clutches, may, in many cases, be improved in operation by a two-speed motor. For instance, a 2-in. ram-type bar turret lathe may be equipped with a 15/7½-hp, 1800/900-rpm motor. Ordinarily this machine has twelve headstock speeds obtained by shifting gears. With the two-speed motor, an additional range of twelve speeds is obtained by a push-button shift in the starter box on the head of the machine. This extends the range of speeds conveniently available to the operator and invariably aids production.



Select the right durable tools—Standard and special tools are properly combined to produce cast-steel part at low cost. Special jaws grip piece with sufficient tightness to permit heavy cutting feeds. Dial indicator on carriage measures adjustment of cross-slide for close forming

8.. GAGE THE FITNESS OF THE MACHINE FOR FURTHER SERVICE:

When is a turret lathe unfit for further service? Generally speaking, high maintenance costs, loss in accuracy, and excessive down-time are considered the important measures of a turret lathe's profit-producing potential. All of these factors relate to deterioration; none of them include the less-frequently discussed factor of obsolescence. Yet, a six-months old machine tool in good condition may be unfit for further service because it is obsolete and thus is not able to compete production-wise with an improved model. When profit margins are thin, as in a competitive economy, the factor of obsolescence as a deterrent to low-cost production is just as important as deterioration. Therefore, a better yardstick by which to gage a turret lathe's ability to produce efficiently is any recognized system of comparing total yearly costs of operations between present equipment and equipment which is available for the job.

For example, a machine in service may be examined for its costs of operation based on maintenance, down-time, scrap or salvage, power consumption, property taxes, insurance, direct and indirect labor costs, and so on. Another machine available for the same service but not present in the user's shop may likewise be examined for its comparative ability based on the factors cited. Should an excess cost of operation appear chargeable to the equipment in use, then it is an economic advisability to make the replacement with the available new machine.

The important point is that inaccuracy, excessive maintenance, and so on, are quite evident and may be spotted without difficulty in equipment in present use. Far less obvious are the lost savings or the excess cost of operations because of another machine which could produce the work at less cost if it were placed in service. A realistic policy should be adopted to keep a machine in use only until such time as it can no longer hold its own against a lower-cost producer.

A secondary advantage of machine replacement lies in work downgrading which takes effect when a new machine is placed in service. Normally, if ten machines in a turret-lathe department are examined and one new machine added, the tenth machine is displaced and much of the more accurate and critical work gravitates naturally to the new machine. In effect, the remaining nine machines then are assigned work on a scale lower than that previously produced. This means that profits may be multiplied throughout the department by virtue of a single machine replacement. All work, in effect, is performed on better machines.

The virtues of these eight fundamentals have been proved in practice. They are an important reservoir of profits and the user of turret lathes is urged to examine his turret-lathe practice continually to make sure he is getting the profits implied by the equipment at hand.

ROUND TABLE

Safety Last

Al stamped into Ed's office near lunch time and deposited his wiry frame in the only good chair.

"Ed, we've got to do something about our safety rules! Either they aren't definite enough, or they aren't well enough known to everyone in the shop."

"My dear fellow," answered Ed with a grin, "if you'll be so kind as to get the heck out of my sitting department, I'll tell you a few things about safety. By the way, what brought on this outburst of yours?"

"Oh, Donaldson just got hit in the eye by a bit of grinding wheel, and he's over making faces at the nurse in the office."

"He happened to forget to wear his goggles, eh?"

"Yeah, that's it. Funny, he remembers to carry his wallet on payday, but he never remembers to prepare for emergencies that might cost him an eye."

"Perfectly natural, friend. You don't find many shop men who give a rap for safety precautions. About the only ones who do are a few who've gotten bit by a hot chip or two in their lives. I can't say as I can answer *why* they don't have much value for their lives, but I know for sure that you can't get one shop man in ten to be really careful."

"Well, it isn't because there aren't enough safety slogans floating around. And on top of that, we had a man from the company that makes goggles and such stuff here just a month ago, demonstrating all his equipment."

"It's not ignorance, Al. It's just plan refusal to conform to the rules. Maybe the men think they'd be laughed at by the other guys, or maybe they're trying to prove that they're real tough boys. I don't know."

"There must be something we can do to cut the danger around here. Actually, this shop could be the safest place the men could find, but it can't if they don't use the equipment that's available."

"That's right, Al. Maybe the answer is a big campaign on safety, or maybe an award to the safest department, or something like that."

"We could try it. We've sure got to cut down our lost time on account of nuisance accidents."

THERE'S NO ARGUMENT HERE; *but there's a problem. How can a medium-size shop make the workers conscious of safety and safety equipment. Is there a quick and easy way, or is constant education, talking, and reminding the only way? Discussions of earlier topics appear on later pages.*

STACKING CHUTES PROTECT LAMINATIONS

STACKING CHUTES keep laminations in line as they drop from progressive pierce and blank die in high-speed press. Chutes handle stator and rotor laminations cut from 3¾-in.-wide, 0.018-in.-thick silicon-steel coil stock. No. 645-B Bliss press operates at 80 strokes per minute, has roller feed and scrap cutter to handle stock from motor-driven coil stand

← **HEAD OF STACKING CHUTE** is steel plate machined to match die in which laminations are cut. Guide rods of chute are brazed to this plate. Also shown is filler plate which is mounted in bolster of press, and to which header plate of chute is bolted. Chute handles four different pole laminations, and has four individual chute assemblies brazed to single header plate

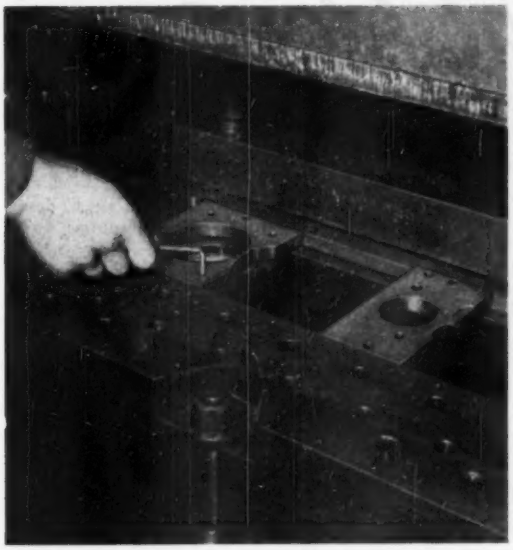
BY J. A. GOODBAR, DIEROOM FOREMAN
LIMA WORKS, WESTINGHOUSE ELECTRIC CORPORATION

OPEN-CONSTRUCTION stacking chutes help protect laminations for small electric motors and generators manufactured at the Lima Works of the Westinghouse Small Motor Division. Made by bending steel rods to shape, and brazing them to stiffening rings, these chutes are designed for mounting in bolster plates which support progressive lamination piercing and blanking dies in high-speed presses.

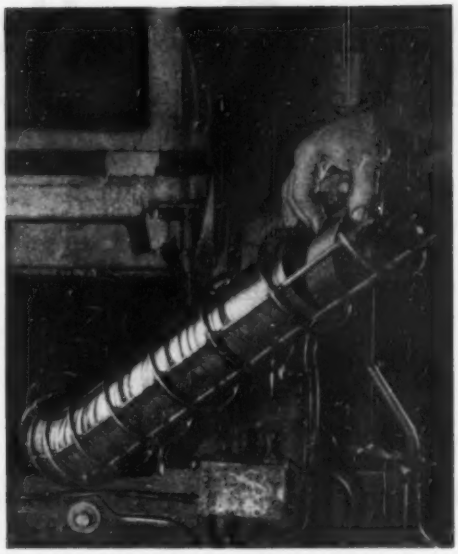
When new lamination dies are made, the necessary stacking chutes are constructed as a part of the die order. Guide rods and stiffening rings usually are made from commercial cold-rolled steel. Each chute is formed to suit the die, the press and its bolster plate, and the delivery conditions desired. Because these conditions vary, no drawings are made to guide the diemaker, who is familiar with the presses on which the work is to be done. To speed setup, the location of chute assemblies is marked on the bolster with match-lines and is identified with the die number. Templets insure proper alignment of the die with the bolster when the die is made.

High-speed steel rods are brazed to the stiffening rings, between the guide rods, at points where the guide rods will wear excessively—usually the curved sections. After mounting in the chute, wear rods are flame hardened with an oxy-acetylene torch and quenched in oil.

Clearance between laminations and guide rods usually is 1/16 to 3/32 in. Clearance generally is increased slightly at turns so lami-



BOLSTER PLATE is slotted to clear header plates of chutes. Ledge, ¾ to 1 in. wide, is machined along each side of slot, 1¼ to 1½-in. below top of bolster. On this ledge is mounted filler block which holds header of chute in place under die. Ledge is drilled and tapped so chutes can be mounted at any position along slot



ENCLOSED WORK-DELIVERY CHUTE provides mounting for stacking chute on Henry & Wright machine. Upper side of delivery end of chute has been cut away so small stacks of laminations easily can be removed by hand

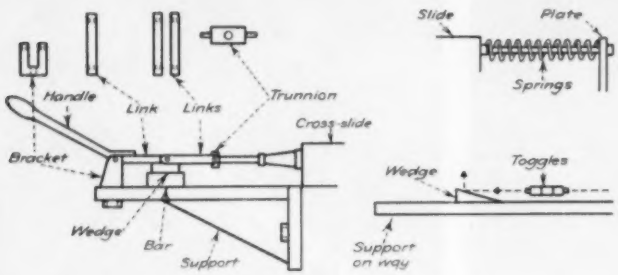
nations can be lifted out of the chute by hand. Usually guide wires are inserted in the laminations before they are withdrawn from the chutes, to prevent scattering them as they are handled. Stocks also can build up above the height of the die without falling from the chute, should the operator fail to remove the work at the usual periodic intervals. This is not a safe condition, however, and, under normal operating circumstances, should not occur. The danger lies in the fact that the weight of the laminations tends to cause them to flow back through the die and may cause double cutting.

To avoid jamming in filling a chute initially, a ball of rags or a properly shaped piece of live rubber is placed in the head end of the chute when it is mounted in the bolster. The pressure of laminations as they are cut then forces the rod through the chute, keeping the stack tight until the chute is filled.

Chutes have been applied, to date, to Bliss high-speed presses and Henry & Wright dieing machines. They have been constructed successfully for laminations ranging from ½ × 1 in. up to 6-in. diameter. Various combinations of chutes also can be applied to a single press with progressive die.

STORAGE RACK at one end of press department supports chutes when they are not in use. Normally chutes are left filled with laminations to save time when job is set up again

Practical Ideas



Toggles Release Toolbit From Threaded Work Instantly

WE HAD a lot of buttress-thread vise screws to cut one time when we were waiting for some quick-opening dies to arrive from our supplier. Our method was conventional at first—threading with a single-point tool geared to the leadscrew of the lathe—but we could not develop enough speed in retracting the tool from the work as we disengaged the split nut on the leadscrew. This trouble made the end of each cut on the work come out at a different point, so the work was not being cut accurately.

We decided to leave the split nut alone, and to concentrate on retracting the toolbit faster. The aim was to make a pair of toggles which would "explode," pulling the tool back instantly at the same point at the end of each cut.

First we removed the cross-slide handle and dial and replaced them with a trunnion held on by the regular nut. The slide leadscrew was disengaged completely so that pressure on the trunnion would force the slide forward, and pulling on it would bring the slide out. Toggles were attached by pinning two links to the trunnion, then pinning a third link to the outer ends of the other two. The outboard end of the single link was supported by a bracket built out from the apron of the machine.

To provide pressure that would "explode" the toggles, we mounted two compression springs, guided by rods, between the rear face of the cross-slide and a plate bolted to the rear of the saddle. When the toggles were exactly in line, they would force the slide back, compressing the springs. But once the toggles were out of alignment, spring pressure would push the slide forward, jackknifing the toggles and moving the slide out.

We made this work by attaching a long bar to the head-end of one of the machine ways. The bar was horizontal and rested on the support bracket that held the toggles at a point directly below the middle link in the toggles.

Now a wedge was clamped on top of this bar and was adjusted to the right position along the bar so it would force the toggles up, out of alignment, just at the point where we wanted to disengage the threading tool.

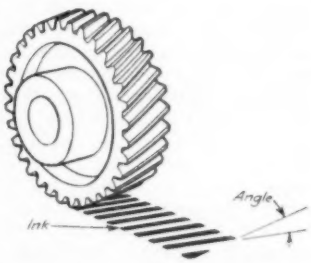
The rig worked fine. After setting the tool in position, adjusted with the compound slide, and with the toggles flat, we started each cut. As the saddle moved down the work to the end of the cut, the wedge snapped the toggles up, allowing the springs to force the cross-slide quickly away from the work, and withdrawing the tool. We did not have to worry about watching the split nut on the leadscrew at all. *N. Palmer, Paddington, Australia.*

Tryout Dies Save Press-Brake Mistakes

TO ELIMINATE wasted stock, damaged dies, and die rebuilding when the first die turns out to be not quite right, a tryout die or set of dies can be made from scrap stock and then tried on a small press.

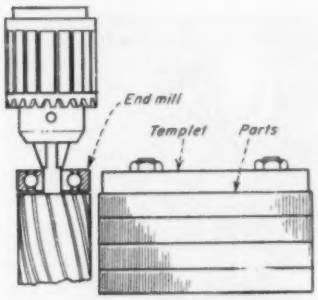
A small strip of the stock metal is cut to be run through the dies for checking purposes. The dies need only be a few inches long, but should be formed, heat-treated, ground, and touched up (if necessary) just as the finished die should be. Minor errors in shape and location of bends can be easily and cheaply corrected on such a sample die, and the final die shape can be established under working conditions.

Tryout dies ranging in length from 4 to 10 in. have been standardized as a development procedure when working out new press-brake dies. *Service Machine Co., Elizabeth, N. J.*



Layout Dye Makes Footprint Of Helical Gear

HERE IS a simple way to measure the helix angle of a gear with accuracy good enough for most purposes. Smear layout dye on the outside edges of the teeth around about a quarter of the gear, then roll the gear on a sheet of paper that is laid on a level table. The "footprint" made can be measured with a protractor after the lines of the impression have been extended. *Frank M. Butrick, Jr., Alma, Mich.*



Drill Rig Does Light Profiling Jobs

DUPLICATE PARTS of thin stock that have to be profiled—providing not much stock must be removed—can be machined on a drillpress. This is done with a straight milling cutter that is attached in the drill spindle with a ball bearing on its shoulder.

Work is clamped together under a templet of the profile desired, and is forced lightly against the cutter. Thrust is taken by the bearing which must be a type that takes both radial and end thrust.

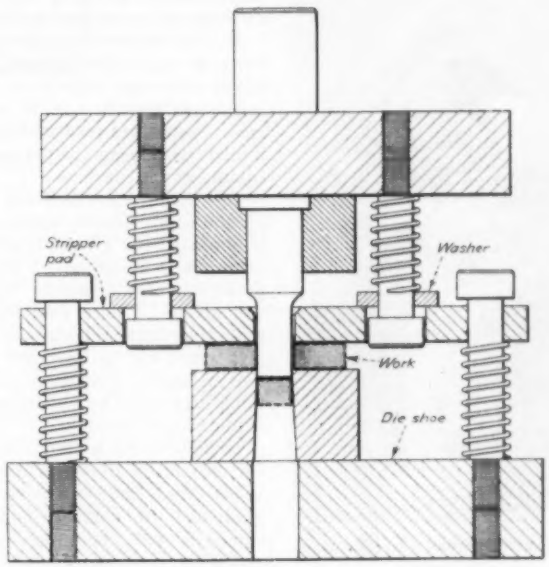
The method is satisfactory for most work that can be fed by hand. *R. G. Vare, Hants, England.*

Three Ideas for Production

A MILLING MACHINE can be utilized to grind or bore large tapered holes or a series of tapered holes—as in a progressive die—by shimming in the dovetails on one side of the column. The amount of shimming necessary can be determined by indicating the tool or quill in a straight bore, then shimming out until the indicator reads the correct amount for the taper. Work should be held on a faceplate or adapter. Either a horizontal or vertical mill could be adapted for this job.

To insure concentricity of the ID and OD of a leader-pin bushing while finish-grinding, the bushing's OD can be ground on the same setup where the pin is ground. After the ID of the bushing and the OD of the pin have been finished, the bushing can be slipped over the pin in the chuck and held there by friction tape. A light pass will not disturb the bushing. The pass must also be light to make sure no heat is developed.

Stop blocks for presses can be adjusted to accurate uniformity under working conditions if a strip of soft solder is placed on top of each one and a hit is made with the product. To even up the stops, the thickness of the thinnest solder strip after flattening is subtracted from the other thicknesses, and the remainder is added to each block. This method will also test the alignment of a press ram. Two heavy parallels are placed on the bolster, and solder strips are placed on these. After the ram descends, the strips should be crushed to equal thickness if alignment is right. *W. Sidney Gilbert, Bridgeport, O.*



Foolproof Stripper Mechanism Works for Heavy-Stock Punching

WHERE A LARGE NUMBER of holes are to be punched in thick stock, the illustrated stripping mechanism will not allow the punches to hold in the material, even if the stripping force is quite large.

The stripper pad is supported against the heads of socket-head stripper bolts by light springs bearing against the die plate; so the bolts both guide and position the pad, but do not grip it firmly. The pad is drilled to clear the punches and the screws in the punch plate. The punch-plate screws guide washers that are held down against the pressure pad when the ram descends by medium-deflection springs.

As the ram drops, the heads of the bolts pass through the pad, and the washers contact the pad, thus forcing it down on the stock. As the ram rises, the bolts and washers retract, and the pad raises only until it is stopped by the stripper screws. The two springs under the pad should be weak enough that the stiffer springs above the pad will force the pad down on the work easily. *Irving Mansfield, New York, N. Y.*

Student-Built Milling Machine Handles Small-Shop Jobs

ILLUSTRATED is one of three milling machines that have been built by students in the Oklahoma Institute of Technology shops. Although the design was developed by H. P. Gerber and myself, and we also made the patterns for the machines, all construction work was done by students. They show what you can do in a small shop if there is a need for it.

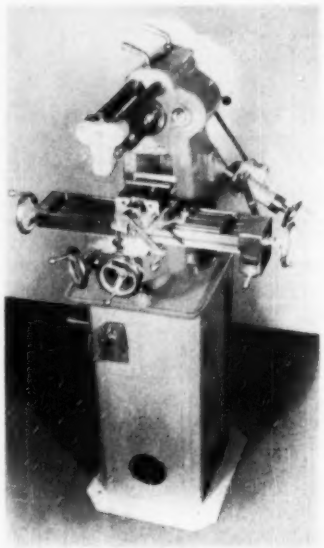
The miller is a small floor model with a 22-in. table that can travel 12½ in. Cross travel is 5 in., and vertical travel is 10½ in. The overall length of the column is 26 in.

A fully-enclosed variable-speed drive develops direct speeds from 235 to 1350 rpm, while back gearing allows speeds from 93 to 235 rpm. Speeds are read directly off a dial tachometer belted to the spindle of the machine.

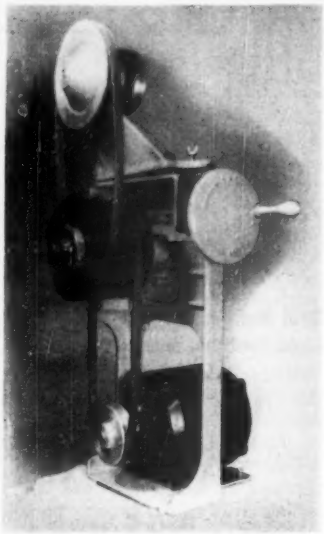
The spindle is hardened and ground on all outside surfaces, and is hardened and ground internally on its No. 3 Morse taper. Timken precision roller bearings support the spindle. Power feed for the table is through an adjustable pulley, which can be reversed. The feed mechanism is mounted on New Departure sealed ball bearings and Oilite bronze bushings.

To go with the milling machine, we also made universal dividing heads. These have two movements graduated in degrees, and are equipped with three hole plates and one direct-indexing plate. The No. 3 Morse taper is ground and hardened. The spindle is hardened and ground outside, except for the threads which are selective-heat-treated and chased after treatment. There is an anti-backlash adjustment between the worm and gear, and there is a spring-loaded adjustment to disengage the worm from the gear when the head is being used for direct-indexing. The rotary base is interchangeable with the milling-machine vise.

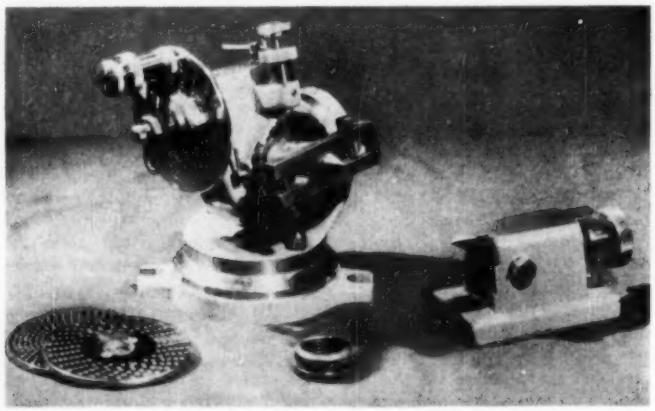
The machine has been operated for over a year, doing a number of small milling jobs, and has proved invaluable. It has operated so well, in fact, that we are making two more machines. *H. J. Gerber, Stillwater, Okla.*



Milling machine has variable spindle speeds, full table controls



Drive unit installed in cabinet runs Doall variable-speed pulley



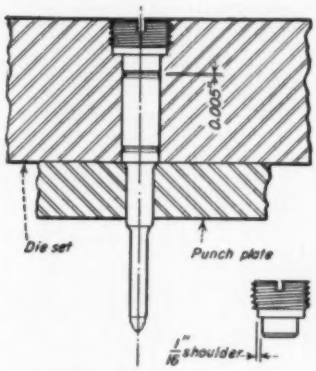
Universal dividing head is equipped with three hole plates and matching center. Both attach directly to miller table with bolts

Second Control Panel Reduces Furnace Downtime

CASE HARDENING steel parts in large quantities calls for as little downtime as possible, especially in rotating, gas-fired retorts. One factor in downtime is the operation of the control panel, where floats can get sticky, tubes can get cloudy, and mixing valves can get dirty —all requiring cleaning out.

To operate the equipment continuously, even when the control panel is being reconditioned, a second, duplicate panel can be installed. If quantities of work produced make this possible, the cost of a second panel will be saved by the production completed while the regular panel is being worked on.

The panel can include a second illuminating and ammonia-mixing setup with all valves and gages. This can be cut in when the original one is cut out, allowing continuous production. *Fred Lettino, Astoria, L. I., N. Y.*

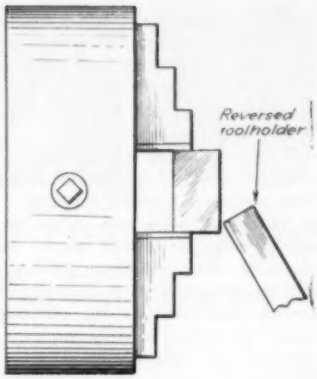


Pilot Back-Up Eliminates Pressure

SOME PILOTS must be pushed back each time the punches are reground to provide new cutting edges. With conventional setscrews and springs backing up the pilots, the tendency is to just compress the spring too much. Often this makes the spring pressure much higher, which may push the punch plate and cock the punches.

A way to avoid this trouble is to make a special shouldered setscrew that can only be driven down to a shoulder in the back-up hole. A slug is placed between the end of the pilot and the screw, with about 5 thousandths left between the slug and the screw.

When punches are reground, this extra space will allow backing off the pilot slightly, but no pressure can develop. *Leonard F. Richardson, Brookline, Mass.*



Nudging Process Lines Up Work for Reworking

WHEN WORK is to be refaced parallel to the original face of the work, an easy way to make sure the work is clamped true is illustrated. The workpiece is clamped loosely in the chuck jaws, then a toolholder is reversed in a toolpost and brought up slowly to the edge of the work as the spindle revolves rapidly. When the edge of the toolholder is touched lightly against the face of the work near the outside edge it will line up the piece quickly. This operation should be done slowly and carefully. After the work is running true the chuck jaws can be clamped securely. *Gerhard Wenke, Los Angeles, Calif.*

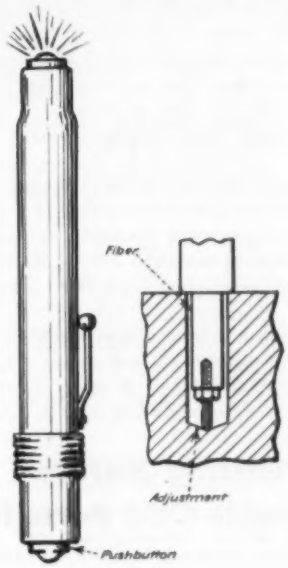
Penlight Gage Checks Hole Depths

A PRODUCTION RUN of hydraulic control blocks call for a number of drilled holes on four different sides of each block. Fast, accurate inspection was necessary to keep the holes from being drilled too deep. We converted a small pushbutton flashlight into a gage.

The regular fiber pushbutton was replaced with a piece of fiber rod that was much longer. This was drilled and tapped and fitted with a headless screw and locknut. Gaging was done by comparing the projection of the screw to a setting block and then inserting the gage into each hole to be inspected.

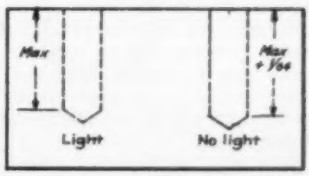
Two holes were drilled into the setting block, one 1/64 in. deeper than the other. The screw on the gage was adjusted so it would touch bottom in the shallower hole and therefore would light the bulb. It would not light when inserted in the deeper hole.

During inspection the gage was used to check hole depths by watching for light flashes. When the gage was inserted into a hole and the light did flash the hole was not too deep. Holes that were too shallow were shown up if the



shoulder of the flashlight did not contact the shoulder of the work, which meant the light did not glow.

We were able to inspect 27/64-in. holes that were 1 1/16 in. deep at a rate of 65 per min. *H. G. Frommer, Milwaukee, Wis.*

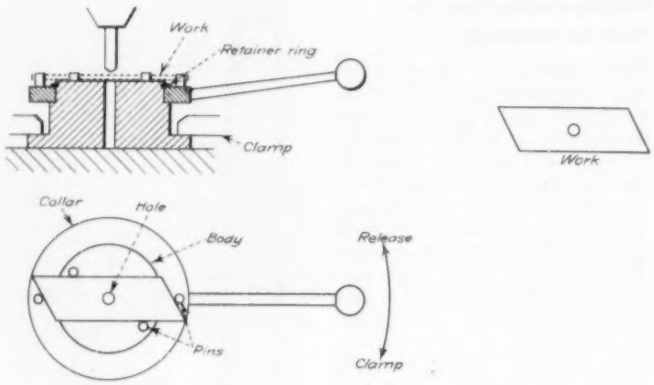


Chewed Pencil Detects Machine Vibrations

IN RECENT YEARS medical stethoscopes have been widely used for detecting knocks and defective bearings in engines, motors, fans, and similar machines. There is a similar method of detecting unwanted noise in machinery that is much simpler and does not require any equipment at all.

To examine, for instance, a roller bearing for defects, take a pencil or light ruler, grip one end firmly in your teeth as if you were biting it, and bring the other end to press against the bearing housing while the machine is running. Then stop both ears firmly with your fingers, which cuts out external noise. Any noise in the bearing will be heard loudly and distinctly.

This method has many applications in everyday work in the shop. One particularly useful application is checking leaky stop valves in steam lines or water mains or checking water mains for flow. In most cases, a distinct hissing sound can be heard when a valve or water main is tested in this manner. *Michael P. Blake, Charleston, W. Va.*



Twisting Fixture Holds Odd Parts for Drilling

HOLES THROUGH a batch of parts like the parallelogram shape illustrated had to be drilled. Size was to be held within 0.005 in. To avoid a clamping fixture, which would have required heavy effort to grip the parts securely, we made a shifting fixture.

The fixture body, bolted to a drillpress table, was made round. It was fitted with two pins, located exactly on opposite sides of the clearance hole drilled through the body. A circular ring carrying two other pins at opposite sides was made to fit on a shoulder on the body, and this was assembled with a ring fitting.

Pins were hardened and ground, and pressed into place. It was necessary that each pin in each set of two should be exactly at the same radius from the clearance hole and exactly opposite the other pin in the pair.

A lever attached to the large ring is used to operate the fixture. During drilling, the operator keeps light hand pressure on the lever, assuring that the part will be gripped steadily. Pushing back the lever releases the part and allows another to be inserted. The advantage of the fixture is that operation during a drilling run is accurate and unusually fast. *A. Vetsch, Steffisburgh Station, Switzerland.*

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PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

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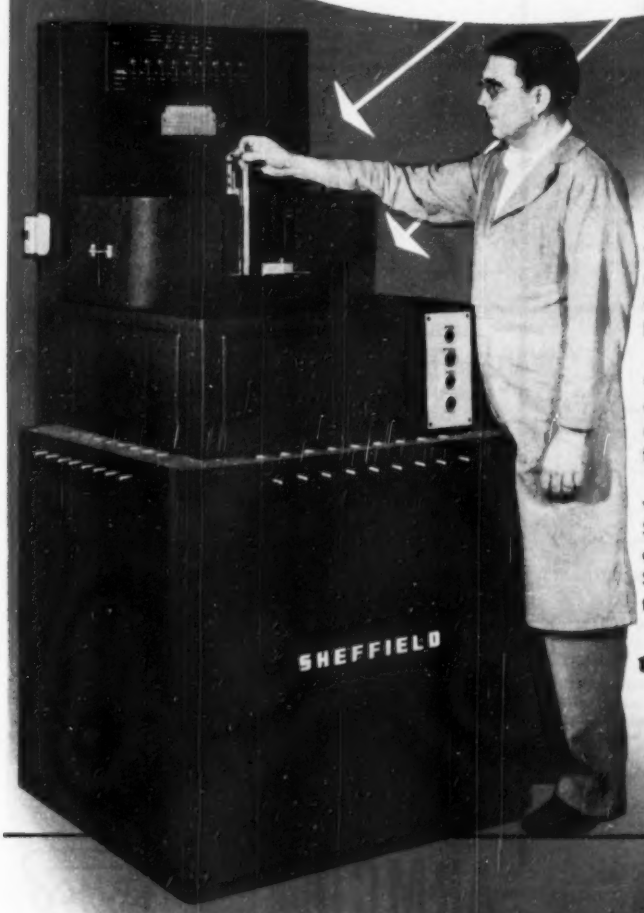

This Sheffield machine gages and segregates refrigerator valve plates into 28 classifications—2,000 parts an hour. It has already paid for itself and is now saving a little more than $1,000 a month over the previous hand gaging method

The job is exacting because these valve plates have a highly lapped finish. They can be completely ruined by even the slightest scratch, and that happened frequently when they were gaged by hand.

The parts are loaded into the machine and a button pressed. The machine sorts and stacks them in individual chutes according to size, without marring their finish.

If you inspect mass-produced parts, why not look into the possibilities of Sheffield gaging and segregating machines. You will gain the benefit of Sheffield's many years of experience in this field. *Write for engineering data.*

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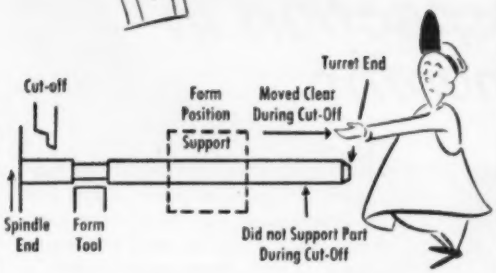
GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

Use Sturdy Supports for Cut-Offs

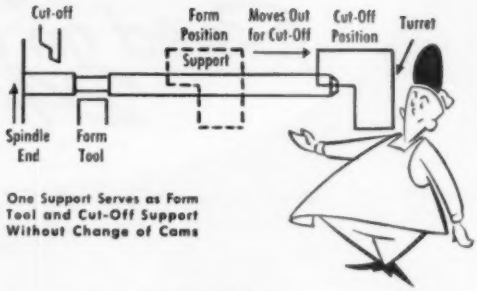
Stainless Sam says



1

A machine shop was having trouble with cut-off tool failures when working with long sections of stainless steel bars. In some cases the part even broke off before completion of the cut-off. At best, the cut-off surface was unsatisfactory.

Stainless Sam found the operator's set-up included a support like the one shown in this drawing.



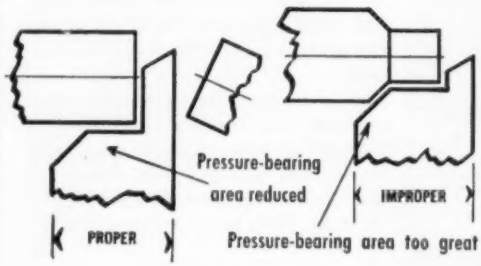
One Support Serves as Form Tool and Cut-Off Support Without Change of Cams

2

Stainless Sam solved the problem for this shop by extending the support from the turret, incorporating a split-type bushing. This way the part is well supported during the cut-off operation.

The hook (top rake) angle was also increased to 15 degrees on the cut-off and form tools.

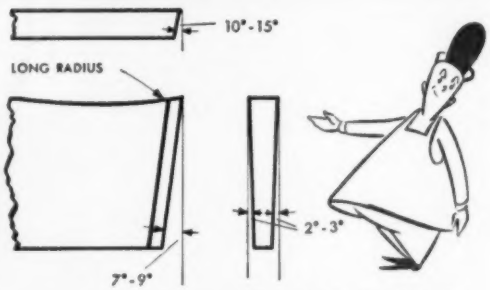
All alterations were made without any change of cams in the machine.



3

When using a combination form and cut-off tool on austenitic stainless steels, be sure the cut-off section completely severs the part before the form tool makes contact with the bar. You can do this by increasing the length of the cut-off tool.

Pressure-bearing areas are reduced by decreasing the width of the form tool.



4

For cut-off operations on Stainless Steels, tools should be made of high-speed steel, one of the cobalt tool steels, cast alloys or carbides. If a high finish is required, a secondary operation with facing tool or grinding is recommended.

A cutting angle of 10° to 15° facilitates chip removal and is suitable for small work. On larger parts this angle can be reduced to 5°. Clearance is provided by the 2° to 3° angle indicated. A front-rake angle of 7° to 9° is recommended.

Cut-off tool work is only one of many subjects discussed in Armco's valuable booklet on the Machining of Armco Stainless Steels.

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Dimensioning for Gage Inspection

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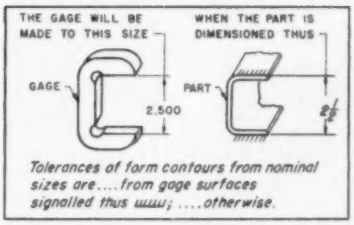
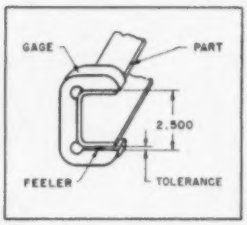

THE GAGE WILL BE MADE TO THIS SIZE
WHEN THE PART IS DIMENSIONED THUS
GAGE
PART
2.500
2½
Tolerances of form contours from nominal sizes are.... from gage surfaces signalled thus uuuu; ....otherwise.

1



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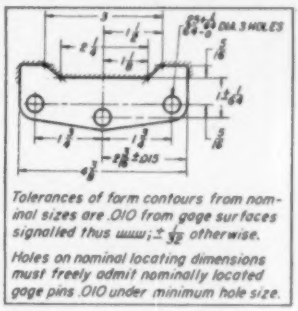
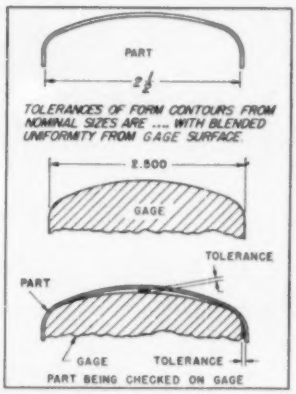

DIA. 3 HOLES
Tolerances of form contours from nominal sizes are .010 from gage surfaces signalled thus uuuu; ± 1/32 otherwise.
Holes on nominal locating dimensions must freely admit nominally located gage pins .010 under minimum hole size.

5



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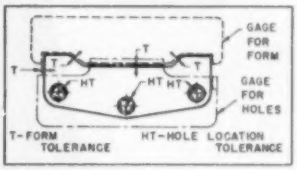

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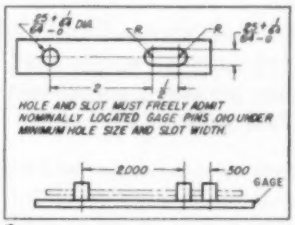

4

TO INSURE interchangeability of parts from multiple sources and to avoid rejection of usable material, specify on drawings exactly the extent to which the parts are subject to inspection by gages.

Parts that have portions which match with mating parts should have those portions dimensioned to gage sizes. Nominal dimensions should be specified for mating portions of parts, along with a statement that they must conform to nominally sized gages within specified tolerances. Nominal dimensions are used because they supply the gage makers with the proper gage sizes.

Matching form contours of mating parts are signalled with slanting lines drawn to the surfaces. The extent of the signalled area is dimensioned. Signalling should be shown in as few views as possible, preferably in the view which best covers its full extent. It may be shown at any convenient angle to the surface and spaced about the same as crosshatching, extending from the surface line ⅛ to ¼ in. depending on size of the part.

In the channel-sectioned part, Fig. 1, the signalled surfaces indicate that they match with mating parts and should be checked by a gage. The 2½-in. dimension which connects them is a nominal dimension (having no tolerances) because it denotes the size of the gage, which is made to exact size.

The tolerance notation indicates that the part is acceptable if it is produced in a size range which extends from maximum size (completely filling the gage opening) to minimum size (loose in the gage to the specified tolerance). A feeler of the tolerance thickness, as shown in Fig. 2, may be used to determine the minimum size.

Sheet metal parts which lack sufficient rigidity to maintain their intended shape when unsupported by gages are indicated on drawings to be checked on nominally sized gages, because that is the only way their true shapes can be determined. A typical sheetmetal part, its tolerance, and the gage on which it is to be checked are shown in Fig. 3.

When dimensioning the distance between the matching holes of mating parts, nominal dimensions should be used. Write a specification that the holes pass over nominally located gage pins of specified diameters, as shown in Fig. 4.

Angular and linear tolerances are omitted from the dimensions used on the matching portions of mating parts, because they are included in the amount of permissible deviation that must be specified in connection with nominal dimensions. For instance, a part having portions which match with other parts, as shown in Fig. 5, may require gage inspection operations as shown in Fig. 6. From these illustrations, it is evident that tolerances are included in the "tolerance" distances between the part and the gage.

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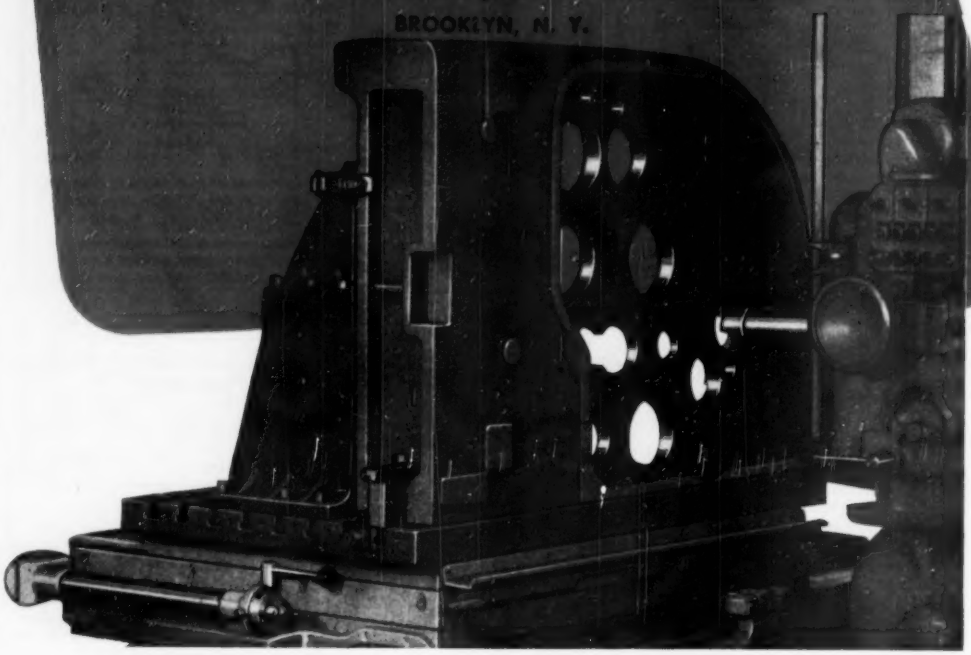

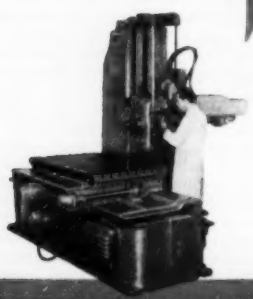

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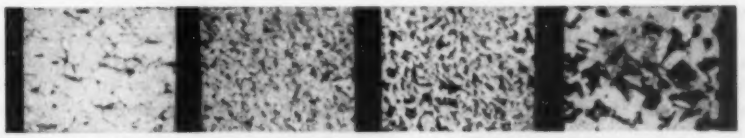

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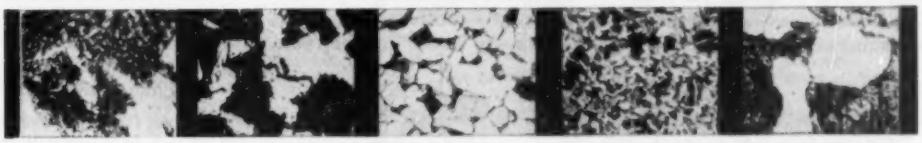


5 700 X 6 700 X 7 100 X 8 100 X 9 700 X

Steel No.	Analysis			Condition	Mach. Rating Percent	Brinell Hardness	Yield-Tensile Ratio	Machined Finish	Rake Angle Deg.
1	B-1112			AR	100	121/149	.72/.75	100	10/15
	"			CD	100	174/212	.90/.94	100	10/15
	Carbon	Manganese	Sulphur						
2	.08/.23	.60/1.00	.08/13	AR	70/75	114/131	.61/.69	35/62	15/20
	"	"	"	CD	65/70	153/166	.82/.84	50/73	10/12
3	.08/.20	.60/1.40	.16/33	AR	85/100	118/137	.64/.68	45/70	15/20
	"	"	"	CD	80/100	153/170	.83/.87	55/85	10/12
4	.14/.20	1.00/1.60	.08/13	AR	75/90	126/159	.63/.69	60/70	12/18
	"	"	"	CD	70/85	159/174	.86/.88	68/80	10/12
5	.23/.55	.70/1.00	.08/13	AR	70/80	156/217	.66/.72	65/80	8/12
	"	"	"	CD	65/72	207/235	.82/.89	86/95	8/10
6	.32/.45	1.35/1.65	.08/13	AR	70/75	183/223	.69/.75	75/85	8/10
	"	"	"	CD	65/72	212/235	.85/.89	90/95	8/10
7	.08/.20	.30/1.00	.05 Max.	AR	50/65	101/143	.50/63	10/30	12/20
	"	"	"	CD	46/60	124/170	.80/.86	25/45	10/18
8	.20/.30	.30/1.00	.05 Max.	AR	65/70	146/163	.66/.70	20/43	10/12
	"	"	"	CD	56/64	159/183	.82/.87	35/60	10/12
9	.30/.50	.50/1.00	.05 Max.	AR	60/75	163/217	.66/72	43/75	8/10
	"	"	"	CD	55/70	183/235	.84/.87	60/85	8/10

AR = As rolled; CD = Cold drawn

MANY FACTORS affect machinability of steels. Among these are: the material analysis, steel-making processes, the mechanical properties and microstructure induced by rolling, forging, cold drawing, annealing, normalizing, and quenching and drawing.

Accompanying data show the effects of rolling and rolling plus cold drawing upon the machinability of carbon-steel rounds. Steels represented are AISI compositions C1008 through C1045 and C1109 through C1141, including resulphurized steels.

It is common practice to accept hardness as a measure of machinability, but this property is not necessarily a reliable guide. Two steels of different composition can be of the same hardness, but their machinability is not the same. In part, this is true because of the method of processing the steel, whereby there is a difference in ductility, and especially in structure. The yield-to-tensile ratio is essentially a measure of ductility. Structures with a predominance of ferrite with low hardness and high ductility are machined at slow speeds to avoid tearing. Cold drawing of such steels aids machinability but is dependent upon the work-hardening ability of the given composition and its structure. Tool life may be decreased.

SUNOCO WAY LUBRICANT
Chosen Over All Others For
WORLD'S LARGEST MILLING MACHINE

The milling machine shown below—the largest in the world, according to its builder—will soon be producing main spars for turbojet planes. The length of the ways and the weight of the table of this mammoth precision-built machine tool make its lubrication a real problem. To hold tolerances and avoid enormous refinishing expenses, the oil must support the table evenly and lubricate the ways perfectly.

To meet such requirements, the way lubricant must combine many qualities. It must be an oil with extreme pressure characteristics, metalwetting capacity, and adhesiveness, so as not to squeeze out under heavy loads; it must flow freely, prevent "stick-slip action" of the table, and successfully resist rusting.

An oil that can meet all those requirements is exceptional. So it is significant that after extensive comparative tests the machine tool builder selected Sunoco Way Lubricant and recommends its exclusive use on the ways of this costly miller. He knows this "Job Proved" Sun product protects his reputation as well as the big investment in time, money, designing skills, craftsmanship.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd., Toronto and Montreal

Overall length: 105 ft. Bed length: 90 ft.
Weight: Approximately 120,000 lbs.
Maximum travel length of carriage: 80 ft.
200 H.P. in carriage through 4 cutter head motors.
Automatic horizontal swarfing to 10° off horizontal.
Automatic vertical swarfing to 15° off vertical.
Thymotrol variable feed. Automatic chip disposal.

Manufacturer:
Onsrud Machine Works, Inc., Chicago, Ill.

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

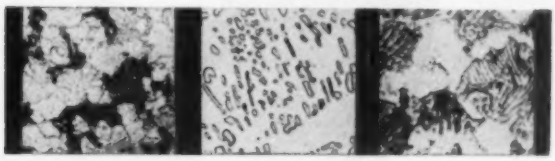
SUNOCO®

Structures and Machinability of ALLOY STEELS

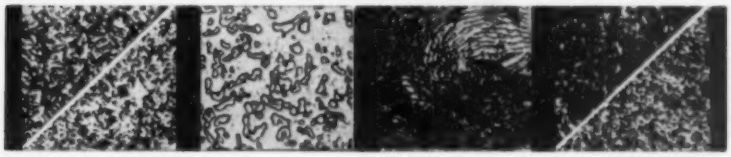
Courtesy BETHLEHEM STEEL COMPANY

Magnifications:
100 × for Steel No. 1
700 × for Steels 2-7

1..Blocky Ferrite | 2..Spheroidite | 3..Lam. Pearlite



4..Tempered Martensite | 5..Spheroidite | 6..Lam. Pearlite | 7..Tempered Martensite



Fine Spheroidite — Fine Spheroidite

Steel	Carbon %	Condition and Structure	Mach. Rating, %	Brinell Hardness	Yield-Tensile Ratio	Machined Finish	Rake Angle, Deg.
1	.08/.30	Normalized or annealed	59/82	149/202	.47/.71	21/50	8/18
	"	Cold drawn	41/75	174/229	.67/.84	39/61	8/16
2	.30/.50	Spheroidized anneal	60/85	146/202	.50/.70	16/30	8/15
	"	Spheroidized CD	47/75	179/235	.70/.86	30/50	8/12
3	"	Lamellar anneal	54/74	156/212	.56/.75	60/83	6/10
	"	Lamellar CD	41/65	192/248	.76/.90	76/90	5/10
4	"	Heat-treated	12/45	229/352	.75/.90	80/100	5/8
	"	Heat-treated CD	10/36	248/352	.81/.93	90/100	4/8
5	.50/.70	Spheroidized anneal	49/70	174/217	.70/.84	21/41	6/10
	"	Spheroidized CD	40/60	202/255	.80/.91	40/60	5/10
6	"	Lamellar anneal	30/58	197/255	.75/.90	70/90	5/10
	"	Lamellar CD	22/52	235/285	.87/.95	90/100	5/8
7	"	Heat-treated	12/40	229/352	.75/.92	85/100	4/8
	"	Heat-treated CD	10/25	269/352	.80/.95	90/100	4/8

THESE DATA apply to AISI compositions divided into three carbon ranges: namely, 0.08 to 0.30% C; 0.30 to 0.50% C, and .50 to 0.70% C. In the first group, normalized or annealed steel is compared with cold-drawn material, whereas in the higher carbon ranges, annealed steel is compared with annealed and cold drawn, and with heat-treated stock. The effects of microstructure, processing and heat-treatment are more marked upon machinability, yield-to-tensile ratio and toolrake angles for alloy steels than for carbon steels.

The quality of the surface finish resulting from machining is a function of the microstructure combined with the hardness-ductility qualities of the material. For a spheroidized annealed steel in the 0.30 to 0.50% C range, a poor machined finish is indicated, because of the structure plus low hardness and high ductility. This condition would be satisfactory for rough turning. Better finish would be obtained by choosing the lamellar pearlite structure from annealing or the structures produced by quenching and tempering. The latter structures are fine spheroidite or tempered martensite, which are dependent upon steel composition, hardenability and mass effect. Quenched and tempered structures are not always economical to machine but if the hardness-ductility ratio is within reasonable limits, the machined finish will be preferable.

SIMONDS
ABRASIVE CO.

Grinding Wheels

for fast, accurate cylindrical grinding

Use Simonds Abrasive Company Grinding Wheels . . . precision manufactured for precision work . . . correct in grain and grade specifications . . . for long lasting action and for your specific requirement from heavy stock removal to high quality finishing.

Exceptionally efficient for grinding all types of steel, alloy steels, cast iron, brass, bronze, aluminum and practically all non-metals. Job range includes plain cylindrical, crankshaft, camshaft, centerless and roll grinding. Write for descriptive bulletins and name of your nearest Simonds Abrasive Distributor equipped to serve you locally.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA., DISTRIBUTORS IN PRINCIPAL CITIES

DIVISION OF SIMONDS SAW AND STEEL CO., FITCHBURG, MASS. OTHER SIMONDS COMPANIES: [illegible] LOCKPORT, N.Y. SIMONDS CANADA SAW CO., LTD., MONTREAL, QUE. AND SIMONDS CANADA ABRASIVE CO., LTD., ARVIDA, QUE.

TALKING SHOP

Perils of Politics

UP IN WORCESTER, Mass., the mayor is Milton Higgins, who happens also to be president of Norton Co. Recently he had one of those ground-breaking chores that so frequently fall to the lot of municipal officials. For the occasion he was handed a shiny shovel with a handle freshly painted in red, white, and blue. He turned a sizable shovel of earth—after which it was discovered that the paint was a shade too fresh. One look at President Higgins' hands that day, and there could be no question of his devotion to our national colors.

British Verve

OUR LONDON BUREAU has had a depressing job in recent years, with most of the stories bearing on the postwar difficulties faced by industry there. This may explain the glee with which they jumped on a recent incident and rushed it to New York. Saunders & Bowers received a cable ordering 100-dozen steak knives. When the order came, on a Friday, there were just five days left to fill it. The design ordered was out of stock. To make the situation worse —and the story better—the die for punching out the rough stock was broken.

We would have assumed that the plant would shut down for the long British weekend, and a letter would be sent sometime explaining why the order was not filled. But not S & B. They worked through the weekend, repaired the die, turned out the knives, and dispatched them by air express. Their representative met the plane in New York and rushed the knives by car to the customer just ahead of the deadline. Could this be a result of the recent visits of British productivity teams to study our methods?

New Grip

HAVE YOU NOTICED how operators almost invariably grab operating levers in getting aboard lift trucks? A leading-man laborer at the Naval Supply Depot, Bayonne, N. J., noticed it, and suggested a grip handle on the truck to aid boarding and to protect the levers. Accordingly, a 10-in. long, ¾-in. round bar, flattened for two 5/16-in. drilled holes, was bolted to the machine frame directly in front of and in line with the operating levers. Thus, when the operator boards the truck, it is impossible for him to grab the levers. The grip makes boarding easier and safer, eliminates breaking-off of the operating levers and consequent layup of the truck for repairs.

The problem might have been attacked with signs saying "Do Not Grab," but this is a solution, not simply an attack.

Preventive Action

IN ONE COMPANY we know of, the plant engineers are having trouble with the MAPI formula for machine-tool replacement. Probably because they haven't had time to study it thoroughly, the top executives view the formula with suspicion. To correct this situation, the plant engineers are applying the formula to even the most routine replacement purchases. This will develop a gradual familiarity with the formula in the purse-string department. Once it is thoroughly understood, there should be no more trouble.

This is a method that might be applied in other plants where the same problem exists. Indeed, its use is not limited to the MAPI formula. Perhaps the old saw should be revised to read, "Familiarity breeds understanding."

Too Fast for Us

ONE OF THE HAZARDS of running material on high-speed machining is the speed with which the situation is changing. In the latest article (*AM*, Aug. 7, 1950 p 100) we mentioned a firm that was gun-drilling a roughly ⅜-in. hole in steel 25 inches deep at 7 ipm. The ink was hardly dry when the man who made the drills, Fred Bloch of Eldorado Tool, dropped in. Mentioned casually that the job was now running at 8 ipm.

Head for the Attic

FRED BLOCH caught us on another item in the same article. The high-rake tool of unusual design on page 101 was one of the earliest lathe tool designs developed, hasn't been seen for decades. His advice is to get your oldest toolmaker, send him browsing through cellars, attics, and storerooms looking for boxes of old tools. You may turn up some brand "new" ideas this way.

Scarlet Paradise

RECENTLY the Research Institute of America gave us a chance to interview four Russian escapees. Their answers gave an insight into metalworking operations in the Soviet Union today.

Production standards are established by picked workers operating under ideal conditions. The rest of the workers are then expected to meet this "norm." Being late once for less than 20 min brings a strict party warning. More than 20 min means a people's court decision, which is six months in jail or at forced labor. Apparently it is unheard of for anyone to ever be late twice, for there is no rule covering that condition.

We could get no data on the costs of machinery because they are allocated to factories by the government with no money involved. Russia is a poor market for materials-handling equipment. It is cheaper to maintain 50 men than to provide one lift truck.

Among the deductions from a Russian paycheck is a 2.5% cultural tax. A portion of this is for the rehabilitation of destitute, unemployed Americans!

News of Metalworking

AIRCRAFT SUBCONTRACTING—Lockheed Aircraft Corp. will subcontract major sections of its military combat planes to established aircraft manufacturers. First to sign up to build Lockheed components is Cessna Aircraft Co., Wichita. Cessna will build tail sections for the F-94 jet interceptor and the T-33 jet-powered trainer.

VISITING WELDERS — Eighteen specialists have arrived here from Britain to investigate American welding processes under sponsorship of Anglo-American Council on Productivity. American Welding Society helped arrange an itinerary of visits to plants in New York, Philadelphia, Milwaukee, Detroit, Pittsburgh and Washington.

NEW RIVETS STANDARDS — American Standards Assn., New York, has approved a revision of the American standard for large rivets (½ in. nominal dia and larger). Major dimensional change concerns pan-head rivets, revised to conform with American Bureau of Shipping and the U.S. Navy.

HAZARDOUS JOBS LISTED—The Labor Dept. has adopted a new hazardous occupations order establishing a minimum age of 18 for employment of minors in occupations involved in operation of power-driven metal forming, punching and shearing machines. A minimum age of 18 has been set also for employment on power-driven hoisting apparatus, including operations which require riding on a manlift.

WILLIAM H. HARRISON, president of International Telephone & Telegraph Corp., named chairman of the National Production Authority

Preference Ratings Will Speed Production on Defense Orders

WASHINGTON—A system of simple preference ratings for defense work is being completed by the National Production Authority and will be put into effect very soon. It merely will give a defense order a rating, whereas non-defense work will not have any rating.

This initial step toward all-out priorities has the merit of enabling the armed services to get production equipment and materials for armament production ahead of civilian users. It also will take off the suppliers of equipment and materials the burden of choosing themselves what customers to favor. These suppliers, however, still will have to pick which non-defense customers are to be favored with early deliveries.

• **Application of E-1-B**—full-fledged priorities—is as far away now as it was a few weeks ago. NPA is not set up to handle such pricrities, and will not be for some time. What's more, need for E-1-B does not exist.

Machinery Division of NPA now comprises about 25 people. Automotive, railroad-car building, electrical machinery, construction and mining machinery, and machine tools are among the industries which come under its jurisdiction. First thing to do is to expand the division's staff, with NPA calling on manufacturers for personnel.

Industry advisory groups will be appointed immediately, including one for the machine tool industry. Process of setting up such groups will be long, because all members are to be cleared for access to "top secret" defense information.

Though NPA is an administrative agency, it will do at least a certain amount of planning. In the planning sphere, it may clash with National Security Resources Board, which has done all the planning up to now.

The feeling is in Washington that NPA is here to stay, no matter what proportions the defense program may reach. Its personnel, made up of civil service men from Commerce Department's Office of Trade and Industry, will be the nucleus of the emergency agency corresponding to World War II's WPB.

The National Production Authority called its first regulation "Inventory Control." But NPA gave no clear indication of what it would consider reasonable levels of inventories. It threatened fines and imprisonment for violators but admittedly had no staff or machinery to enforce the regulation.

NPA conceded its definition of inventory limitation — "The smallest quantity . . . from which a person can reasonably meet his deliveries or supply his services" was fuzzy. Apparently, it hoped the list of scarce materials would frighten users into going easy to avoid a real crackdown on inventory hoarding.

The materials list included 32 items, most of them no surprise to businessmen. The majority were iron, steel and non-ferrous metals long known to be in short supply.

Drop Forgers Set to Meet Military Needs

CLEVELAND — Commercial drop forgers attending the fall meeting of the Drop Forging Association were optimistic about their ability to meet expanding requirements for drop forgings.

New orders booked in July were the largest since March 1945 and brought the total for the first seven months of this year to $230 million, up 87% from the same period last year. The industry is now operating with a backlog of 3½ to 4 months.

• **Production facilities** are expected to be adequate. The supply of hot-rolled bars for forging is expected to be the immediate bottleneck with shortages in skilled personnel looming ahead. Much of the time at the meeting was devoted to these two problems.

Harold F. Wood, general manager of the Ingalls-Shepard Div. of Wyman-Gordon, and president of the Drop Forging Association, told the members that while they could be proud of the job they did in the last war they must think back on the errors that were made so they wouldn't be repeated in another emergency.

JET FIGHTERS are rolling from Lockheed Aircraft's production lines in Burbank, Calif., to meet accelerated USAF jet plane requirements. New emphasis is being put on final assembly of Lockheed's F-94 all-weather jet interceptor, an advanced development of the F-80 Shooting Star now in combat in Korea. Ten years ago these assembly lines were producing the Lockheed P-38

World's Largest Naval Gun Factory Completing $2 Million Modernization

WASHINGTON — The current rearmament program finds the U.S. Naval Gun Factory well prepared. The NGF is the federal government's chief gun-making establishment and the largest naval gun factory in the world. It is now completing a 5-year modernization program which will result in increased efficiency.

Located only a mile from Capitol hill, the 151-year Gun Factory was known until 1945 as the Washington Navy Yard. Its buildings are sprawled over a 125-acre reservation on the banks of the Anacostia River.

• **NGF is the largest** industrial establishment in the non-industrial Capitol. As many as 24,000 people were employed in its huge shops, forges and warehouses during World War II. Until recently only about half this number worked in the shops. To meet demands of the nation's rearmament program more men are being put to work.

Those coming back after a lapse of several years will find mechanization has taken over and the old back-breaking hand work is no more. Toward the end of World War II a $2 million steel and brass foundry modernization program was begun. A systematic effort was made to bring efficiency into the establishment.

The program is nearing completion under Rear Admiral B. Hall Hanlon, new superintendent of the Factory and until a few months ago director of the Naval Ordnance Laboratory at White Oak, Maryland.

• **The most important change** is the replacement of the old open hearths with new 10 and 25 ton electric furnaces. Mechanical buckets have cut the time of "charging" a furnace from a half day to 15 minutes.

Sand conditioning and handling equipment in the brass foundry has been installed and is in use. The new molding machines, for example, have cut time needed to pack the sand mixture around the wooden patterns from a half hour to four minutes.

With the exception that the owner is Uncle Sam, the Factory is run about the same as a commercial plant. While its main work is work-a-day production, it conducts research into the development of steels, making its own steel for different uses.

With the remaining equipment to be installed this fall, the Factory will be ready for any wartime load.

New Companies Formed

Rem-Cru Titanium, Inc., has been organized jointly by Remington Arms Co., Inc., Bridgeport, Conn., and Crucible Steel Co. of America, New York, to produce titanium metal and titanium alloy products. Headquarters will be in the Pittsburgh area, with sales and research activities being handled from Bridgeport offices of Remington Arms for the time being. President of Rem-Cru is W. H. Colvin, Jr., president of Crucible. Remington's president and general manager, C. K. Davis, is chairman of Rem-Cru.

Raytor Corp., Norristown, Pa., has been formed to manufacture metal specialties. Waldo H. Torluemke is president and general manager. The 15,000 sq ft Raytor plant is located on Skippack Pike.

Progressive Welder Sales Co., Detroit, has been formed to handle sales and engineering functions of Progressive Welder Co., Warren Machine Co., Warren Alloys, Inc., and Viking Products. Offices are at 3070 East Outer Drive.

Micro Drill Guide & Engineering Co., 18515 Weaver Ave., Detroit, has been formed by R. A. Thompson and E. R. Daly, both formerly with Colonial Bushings, Inc. The new firm offers a line of over 1700 types of standardized micro-drill jig bushings and liners for small hole drilling operations.

Caterpillar Tractor Co. Ltd. has been formed as a wholly owned British subsidiary of Caterpillar Tractor Co., Peoria, Ill. The new company will engage in procuring, inspecting, storing and shipping British-made "Caterpillar" parts to the company's dealers in United Kingdom and other countries. Wallace J. Bornholdt, Caterpillar purchasing agent, is managing director.

Ardec, Inc., Media, Pa., has been formed to specialize in production of precision parts and assemblies on a production basis for the aircraft, automotive, diesel engine, instrument, electronic, small arms and allied industries. William A. Arnken is president.

Plant Expansions

Warner & Swasey Co., Cleveland, is transferring manufacture of the Gradall, multi-purpose earthmover, from Cleveland to a plant leased by the company in New Philadelphia, Ohio, formerly occupied by American Sheet & Tin Plate. The move is expected to simplify the planned doubling of 1951 production schedules to reach a rate of from 20-30 machines monthly.

Vulcan Mold & Iron Co., Latrobe, Pa., has started construction of a new $1-million plant at Lansing, Ill., for manufacture of ingot molds and accessories. The new plant, to be completed next spring, will increase Vulcan's present capacity by 50%.

Armco Steel Corp., Middletown, Ohio, will spend at least $15 million to modernize its Ashland, Ky., plant, to be started the first of next year. A modern slabbing mill will be installed, along with other rolling and processing equipment necessary to produce steel coils 72-in. wide.

Acme Steel Co., Chicago, has started construction of a new $125,000 building at Perry Avenue and Acme Road, Riverdale, Ill., near the main plant. All visitor-centered activities—reception, purchasing, and employment—will be combined there.

Borg-Warner Corp.'s Marvel-Schebler Carburetor Div. will produce fuel pumps for jet plane engines in a newly rehabilitated and expanded plant to be opened this month in Decatur, Ill. The company's name will be changed to Marvel-Schebler Products Division.

Hooker-Detrex Inc. has completed a large, modern trichlorethylene manufacturing plant at Ashtabula, Ohio, to be used in manufacture of degreasing solvents for Detrex Corp., Detroit. Hooker-Detrex is a jointly owned subsidiary of Hooker Electrochemical Co. and Detrex Corp.

Flexible Tubing Corp., Branford, Conn., will move next month into its new 13,000 sq ft plant in Guilford, Conn.

West German, Italian Rearmament Slowed by Scarcity of Capital

(McGraw-Hill World News)

REARMAMENT has become a vital factor in the economic plans of West Germany and Italy. But capital seems to be running too thin to back maximum production.

In West Germany the problem is so complex that direct arms production is hardly possible in the near future. For example, the nation's steel industry requested 200 million ERP marks this year to insure an output of 13 to 14 million tons, but the request has not been acted upon.

West Germany seems best suited to supply a wide range of auxiliary equipment. Conversion necessary for such production might entail using the optical industry for making range-finders, automotive plants for vehicles and parts (perhaps gun carriages), electrical firms for communications equipment. These efforts alone would strain the steel supply.

The Bonn government maintains that West Germans are carrying maximum taxes consistent with sound economic policy and that arms spending must not pinch aid to some 10 or 11 million refugees. Feeling is that greater revenue for the military must come from an increased national product rather than from reconversion or boosted taxes. In any case Allied pressure regarding a financial contribution to rearmament must await decision on just how many West Germans will bolster the ranks of the projected western European army.

• **Italian rearmament** poses problems too. But Prime Minister DeGasperi's financial problem is more cut-and-dried than that facing West Germany. In Italy, with labor reserves and armament and heavy engineering works idle several years, rearmament will mean more employment and a generally higher living standard. Thus military and civilian requirements could be filled simultaneously.

But the crux of the situation is capital. If DeGasperi attempted to prime the armament pump himself, Italy would take a big loss. Subsequent inflation could not be curbed by a government lacking economic control and large tax resources. And DeGasperi can't risk political unrest.

Therefore, the only Italian hope is additional U. S. aid. If fiscal hurdles are overcome, Italy can make a worthwhile contribution to European armament in the first period of '52.

Latest Defense Awards—Aircraft

WASHINGTON—Top defense contracts last month went to Pratt & Whitney Aircraft, Wright Aeronautical Corp., and Republic Aviation, the Department of Commerce's September listings show. Awards in metalworking over $100,000 are as follows:

AIR FORCE

Pratt & Whitney Aircraft, E. Hartford, Conn., turbo jet development, $3,300,000; turbo jet engines, $4,650,000.

Wright Aeronautical Corp., Wood Ridge, N. J., reconditioning cylinder assemblies, $5,800,613.

Republic Aviation Corp., Farmingdale, L. I., N. Y., misc. assemblies, subassemblies, kits and spare parts, $4,334,780.

Firestone Tire & Rubber Co., Los Angeles, fuel cells for B-26, $179,685.

Fletcher Aviation Corp., Pasadena, Calif., jettisonable fuel tanks, $1,007,350.

Beech Aircraft Corp., Wichita, Kans., jettisonable fuel tanks, $973,250.

Webster-Chicago Corp., Chicago, cables for AN/APQ-24, $141,620.

Phaostron Co., S. Pasadena, Calif., multimeters, $302,157.

Goodyear Tire & Rubber Co., Akron, Ohio, wheels and brakes, $229,395.

AC Spark Plug Div., General Motors Corp., Flint, Mich., spark plugs, $1,143,848.

Aeroproducts Div., General Motors Corp., Dayton, adaption and fabrication of 4 propellers in support of C-119 aircraft, $314,298.

Lockheed Aircraft Corp., Burbank, Calif., miscellaneous spare parts for F-80 and T-33 aircraft, $3,568,445.

Vectron, Inc., Waltham, Mass., servo test stand assemblies, $143,200.

Interstate Engineering Corp., El Segundo, Calif., strut assemblies, $300,000.

Douglas Aircraft Co., Inc., Santa Monica, Calif., spares for aircraft., $3,500,000.

Western Electric Co., New York, sub-assemblies for AN-APQ-24, $2,682,374.

Cincinnati Electronics Co., Cincinnati, receivers, $677,243.

Bendix Aviation Corp., South Bend, Ind., speed density metering unit, $117,997.

Cornelius Co., Minneapolis, air compressors, $117,800.

Westinghouse Electric Corp., Dayton, Ohio, alternator assemblies, voltage regulators, $193,065.

Arthur D. Little, Inc., Cambridge, Mass., gas turbine assemblies, $111,000.

Cook Electric Co., Chicago, recovery systems, $275,000.

NAVY

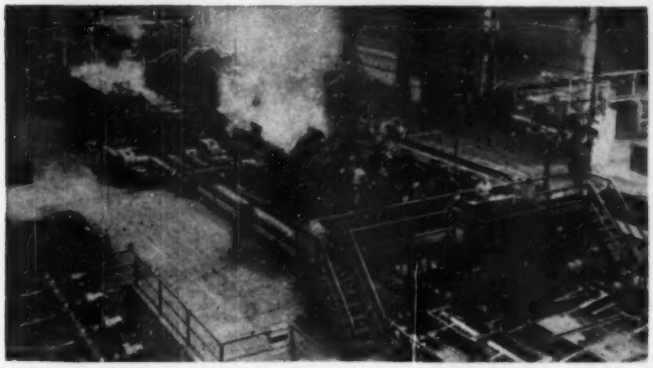
Packard Motor Car Co., Detroit, diesel engines and diesel engine generator sets, $4,000,000.

Hopkins Engineering Co., Washington, D. C., engineering services and technical labor for radio interference investigations ashore and afloat, $150,000.

Logan Co., Louisville, Ky., conveyors, gravity roller, $314,226.

Rapids-Standard Co., Grand Rapids, Mich., conveyors, gravity, wheel support, $122,676.

Clary-Multiplier Corp., Los Angeles, services & material to depreserve, inspect, clean, test, etc., gov't-owned aircraft bearings, $500,000.



MANDREL MILL in center of photo is the "heart" of National Tube Company's new, almost completely automatic pipe-making facilities at Lorain, Ohio

New Continuous Mill Can Turn Out 18,000 Tons of Steel Pipe Monthly

LORAIN, Ohio—After 20 years of study and research and expenditure of more than $100 million on the complete plant program, U.S. Steel's National Tube Co. is presently working final bugs out of an almost completely automatic continuous seamless pipe mill at its Lorain plant. The mill is geared to produce 18,000 tons of steel pipe per month, of 2-in. to 4-in. dia.

• **Here's what happens:** Steel billets 5½-in. round and 9-ft long emerge from the blooming mill measuring 5¾-in. dia and 25-ft long. Piercing of the billets is done at a rate of 30-in. per sec. The mandrel mill then takes the steel shell, and in one pass through nine sets of rolls processes it into pipe 5-in. O.D. and 62-ft long, with a ¼-in. wall. Eliminated are the two to four pasess on a conventional-type high mill and the usual three to five reeling operations.

The 62-ft long shell delivered to the reducing mill produces a tube 140-ft long by 2⅜-in. O.D. in less than five minutes from the time the billet leaves the furnace until the pipe is ready for the finishing floor.

Makers Get Largest Contracts

Metal Industries, Indianapolis, Ind., metal shipping container assemblies, $123,980.

Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J., automatic engine controls for FSF-2 aircraft.

Mine Safety Appl. Co., Pittsburgh, oxygen masks for use in aircraft, $125,682.

Caterpillar Tractor Co., Peoria, Ill., motor graders, $232,419.

Northrop Aircraft Corp., Northrop Aeronautical Institute Div., data reduction as required, $150,000.

Clark Equipment Co., Washington, D. C., gasoline fork trucks, $2,271,074.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., carburetor assemblies, $2,111,419.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., boost control for Pratt & Whitney engines, $230,238.

Badger Mfg. Co., Cambridge, Mass., distilling plant, $150,000.

Martinolich Shipbuilding Co., San Diego, Calif., overhaul & repair on boats, $139,265.

Orton Crane & Shovel Co., Chicago, crane shovels, $294,700.

ARMY

Cadillac Motor Car Div., General Motors Corp., Detroit, engine assemblies and spare parts, transmission assemblies and spare parts, $7,801,669.

Telegraph Apparatus Co., chest sets, $283,480.

Carnegie-Illinois Steel Corp., Washington, D. C., plates: homogeneous, ½-6-in. thick, $320,860.

Midvale Co., Philadelphia, plates: homogeneous, 7-and 8-in. thick., $136,930.

Republic Drill & Tool Co., Chicago, drills, $523,706.

Gar-Wood Industries Inc., Wayne, Mich., cargo bodies, $506,706.

Hobart Bros. Co., Troy, Ohio, welders, $122,682.

Phister Mfg. Co., Cincinnati, extinguishers, $159,741.

Pyrene Mfg. Co., Newark, N. J., extinguishers, $196,983.

Bendix Products Div., South Bend, Ind., valve assemblies, Hydrovac check retainers, brake cylinders, brake control valve housing, power brake control screens, Hydrovac cylinder repair kits, etc., $182,712.

AFC Brill Motors Co., Philadelphia, ambulance buses and spare parts, $107,043.

Thomas A. Edison, Inc., West Orange, N. J., batteries, $1,278,900.

Solar Corp., Milwaukee, batteries, $145,800.

Willard Storage Battery Co., Cleveland, batteries, $895,150.

United Battery Co., Los Angeles, batteries, $588,400.

Colt's Mfg. Co., Hartford, Conn., barrels, slide assemblies and front sights, $158,620.

Harrington & Richardson, Worcester, Mass., barrels, $890,770.

Horie Arms Co., Deep River, Conn., Cartridge clips, $106,250.

Thew Shovel Co., Lorain, Ohio, crane shovels, $676,844.

Bay City Shovels, Inc., Bay City, Mich., cranes, $420,000.

Greenlee Tool Co., Rockford, Ill., bits, $135,000.

Lonergan Mfg. Co., Albion, Mich., oil burner tent stoves, $786,196.

Palmer Mfg. Co., Phoenix, Ariz., oil burner tent stoves, $219,918.

Automatic Products Co., Milwaukee, control valves for oil burner stoves, $354,928.

Metal Carrier Corp., Grand Rapids, Mich., inflammable gas drums, 5 gal., $1,131,000.

Nesco, Inc., Milwaukee, 5 gal water cans, $1,822,731.

Reeves Steel & Mfg. Co., Dover, Ohio, corrugated ash & garbage cans, $591,225.

Wheeling Corrugating Co., Wheeling, W. Va., corrugated ash & garbage cans, $301,073.

Viking Refrigerators, Inc., Kansas City, Mo., refrigerators, prefab., $199,960.

Warren Co., Atlanta, Ga., refrigerators, prefab., $276,593.

Triumph Mfg. Co., Cincinnati, vertical mixers, $454,306.

Timken Roller Bearing Co., Canton, Ohio, roller bearings, $284,008.

Firestone Tire & Rubber Co., Akron, Ohio, disc. wheels with tires, $3,662,000.

National Wholesalers, Inc., Los Angeles, fuel tanks, $146,625.

Hallicrafters Co., Chicago, radio sets, $2,500,000.

Willard Storage Battery Co., Cleveland, storage batteries, $194,608.

American Brake Shoe Co., American Forge Div., Chicago, forgings, shell body, 75mm, $368,940.

Acme Battery Co., Brooklyn, N. Y., training batteries, $174,600.

Molded Insulation Co., Philadelphia, radiosonde transmitters, $138,000.

New Offices Opened

Ace Drill Corp. has moved plant and offices from Detroit to 2600 East Maumee Ave., Adrian, Mich. The new plant more than doubles previous manufacturing area.

United Centrifugal Pumps, Div. of United Iron Works, Oakland, Calif., has opened eastern headquarters at 225 Broadway, New York, headed by John Re.

Anderson Machine Tool Co. has moved to new quarters at 2631 University Ave., St. Paul, Minn.

Standard Tool Co., Cleveland, has moved its Detroit office to 2967 East Grand Boulevard.

Hy-Pro Tool Co., New Bedford, Mass., is now completely established in its new large plant adjoining the plant of its parent company, Continental Screw Co., in the Mt. Pleasant suburb of New Bedford.

Foxboro Co., Foxboro, Mass., has opened new branch offices at 214 West 10th St., Wilmington, Del., and 225 South 5th St., Minneapolis.

Adel Div. of General Metals Corp. has moved from Stamford, Conn., to new offices in the Stevens Bldg., 42 Third Ave., Mineola, Long Island, N. Y.

Raybestos-Manhattan, Inc., Passaic, N. J., has moved its New Orleans office and warehouse from 1009 Camp St. to 920 Calliope St.

American Machine Tool Distributors' Association has moved from from 505 to 1900 Arch St., Philadelphia.

Ralph G. Lagerfeldt

Harry Gotberg

M. R. Hatch

Maurice N. Trainer

Names in the News

Ralph G. Lagerfeldt, formerly vice president in charge of sales, has been named executive vice president of Colonial Broach Co., Detroit. **Harry Gotberg,** formerly chief engineer, has been named vice president, supervising sales engineering, experimental engineering and estimating. **Wm. Kukuk** has been appointed factory manager. **Ben F. Welte** has been named chief engineer, with **Glen Harmon** as assistant chief engineer. **Hans Reitz** has been named superintendent of machine construction.

Frederick C. Shafer, has been elected president and director of Imperial Brass Mfg. Co., Chicago. **C. H. Benson** and **J. T. Greenlee** have been named vice presidents.

H. L. Howard, executive vice president and treasurer of Texas Engineering and Mfg. Co., Inc., Grand Prairie, Texas, has been elected president of Luscombe Airplane Corp., Dallas, Texas, following recent Luscombe reorganization. Luscombe directors who are also directors of Temco are **D. Harold Byrd, H. L. Howard,** and **Robert McCulloch.**

David T. Woodhouse has been named manager of product development and methods at Cleveland Chain & Mfg. Co., Cleveland.

F. C. Merk has been appointed director of engineering for the Farrell Works of Sharon Steel Corp., Sharon, Pa.

Julius H. Peters, formerly secretary and chief engineer of Colonial Iron Works, Cleveland, has been named president of Leader Iron Works, Decatur, Ill. His son, **E. D. Peters,** was named vice-president.

M. R. Hatch has been named chief engineer, Press Div., E. W. Bliss Co., Toledo. His primary responsibility is development and production engineering work on large single-action mechanical presses. He holds numerous patents in the company name and was responsible for developing the first air-operated friction clutch for use on a mechanical press.

Charles R. Beeson has been named vice president of Ohio Stainless & Commercial Steel Co., Cleveland.

Charles R. Vincent, formerly general sales manager for Harry Ferguson, Inc., and later managing director for that firm in Coventry, England, has been appointed manager of the Farm Sales Dept. of Willys-Overland Motors, Inc.

C. S. Davis, Jr. has been named president of Norge Heat Div., Borg-Warner Corp., Chicago. He was vice president and general manager of Norge Heat.

J. J. Mataitis has been appointed tool engineer for the Midvale Co., Philadelphia.

Maurice N. Trainer, first vice president of American Brake Shoe Co., New York, has been elected president, succeeding **William B. Given, Jr.,** elected chairman of the board. Mr. Trainer is also president of Dominion Brake Shoe Co., Ltd., a Canadian subsidiary. Mr. Given had been president since 1929.

John J. O'Farrell has been named management engineer, Hyster Co., Portland, Oregon. **Kirk Lowe** has been appointed pressed metals engineer, Manufacturing Engineering Dept. **Harold R. Lucas, Jr.** has been named assistant to the general sales manager. **Henry Benit** has been put in charge of demonstrations of the Hyster grid roller. **W. M. Costley** has been appointed a district sales manager for several midwestern states, while **Dan Stearns** will handle sales in Pennsylvania, New Jersey, Virginia, West Virginia, and the District of Columbia. **Hal White, Jr.** has been named purchasing engineer.

Lawrence F. Black has been appointed general plant superintendent of Geneva Steel Co., Geneva, Ohio, subsidiary of U. S. Steel Corp. Fomerly he was chief engineer of American Steel and Wire Co.

OBITUARIES

G. Harold Young, 48, vice president and chief engineer of Midwest-Fulton Machine Co., died September 4.

George R. Gibbons, 71, a director of Aluminum Company of America, died Sept. 3. He retired as senior vice president last year.

George W. McIntyre, manager since 1926 of the New York office of Reed-Prentice Corp., Worcester, Mass., died August 29.

George F. Alderdice Jr., 41, former Carnegie-Illinois Steel Corp. transportation executive, died August 9.

N. G. Sixt has been named technical assistant to **Fred P. Hauck**, vice president of Michigan Abrasive Co., Detroit. Mr. Sixt is a former Carborundum process engineer.

Clyde R. Paton has been named director of engineering for Willys-Overland Motors, Inc. He had been associated previously with Packard, Studebaker, General Motors, and Ford. **Delmar G. Roos** continues as first vice president, with new duties in a research and advisory capacity.

Charles N. Chalfant has been named industrial service representative in the metropolitan New Jersey area for Optimus Detergents Co., Matawan, N. J.

Jacob Joachimi has joined A. E. Bausenbach, Inc., Buffalo, N. Y., as factory manager. He was with Bell Aircraft Corp. for ten years, serving during the war as the Buffalo plant manager.

Earl M. Nelson has been named regional sales manager for 15 midwestern states by National Electric Products Corp., Pittsburgh. He has been assistant general manager of I. A. Bennett & Co.

Robert Paxton, recently named manager of manufacturing policy for the General Electric Co., has been elected a vice president. He had previously been manager of the Transformer and Allied Products Divisions with headquarters in Pittsfield, Mass. He has been succeeded there by **James M. Crawford,** who has been manager of the Apparatus Department's Large Motor and Generator Divisions. As manager of manufacturing policy Mr. Paxton succeeded **Raymond R. Rausch** who resigned to join Willys-Overland Motors, Inc. as vice president and executive assistant to the president.

GISHOLT Machine Co. Secretary George E. Gernon was recently honored by the Madison, Wis., firm for having completed 50 years of service. At a ceremony in his office Mr. Gernon was presented with a gold watch and a 50-year diamond service pin. Presentation was made by George H. Johnson, Gisholt president (right).

William F. McConnor has been elected executive vice president of National Tube Co., subsidiary of U. S. Steel. He is succeeded in the position of sales vice president by **H. J. Wallace.** Other appointments: **William J. McKee,** general manager of sales; **Louis W. Mason,** sales manager.

Louis R. Botsai has been named manager, Buffalo Motor & Control Division, Westinghouse Electric Corp., succeeding **Leon R. Ludwig,** who has been shifted to Pittsburgh to serve on the staff of John K. Hodnette, vice president. Mr. Botsai has been with Westinghouse since 1915. Mr. Ludwig, with Westinghouse since 1925, has worked in the firm's research laboratories. **Dr. E. Bruce Ashcraft** has been appointed advisory engineer for the Chemical Dept., Westinghouse Research Laboratories.

E. A. Henry has been named wire die specialist in charge of Firth Sterling Steel & Carbide Corp.'s new die finishing shop in Chicago. He will be assisted there by **Andrew Marhefka.**

Houston E. Landis, Jr., has been elected vice president of Electrol, Inc., Kingston, N. Y. He formerly was with Air Reduction Sales Co., served as president of Ohio Chemical & Mfg. Co., and as vice president of Arcrods Corp., two subsidiaries.

H. O. Holland has been named vice president in charge of sales of all divisions of Automatic Steel Products Co., Canton, Ohio. **John E. Carnahan,** formerly division sales manager of the company's Spun Steel Div., has been named vice president of that division.

Frank J. Lunney, a past president of Machinery Dealers National Assn., has been named eastern division manager of Interstate Machinery Co., Chicago.

R. A. Juusola, formerly supervisor of industrial engineering, has been named plant manager of weld, wire and small parts operations for the Parts Div., Sylvania Electric Products, Inc. He joined Sylvania in 1941 and has been with the Parts Div. at Warren, Pa., since 1944.

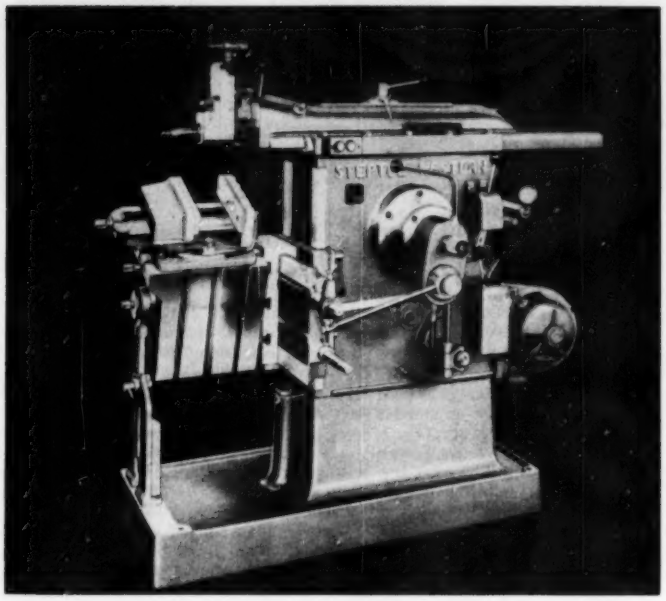
Robert Paxton

James M. Crawford

E. A. Henry

R. A. Juusola

New Shop Equipment



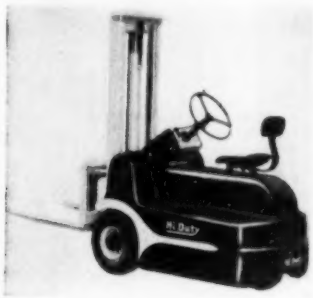
Western High-Speed Shaper Has 18 All-Geared Speeds

Western Machine Tool has developed a line of 12- and 15-in. shapers with 9 or 18 all-geared speeds. Ram speeds are up to 200 spm, with 8 automatic reversible feeds.

Features include V-ram, helical bull gear, alloy-steel gearing, pressure lubrication, 3-hp V-belt drive, involute splined shafts, and Timken bearings. All machines are back-geared, and speed changes are via sliding gears. A swivel vise is provided, 10 in. wide x 2½ in. deep, with 9½-in. opening. The adjustable clutch and ram brake are synchronized in a convenient start-stop lever.

Western Machine Tool Works, Holland, Mich.

(MORE DATA? CIRCLE FYI 31, p. 145)



Transitier Fork-Lift Truck Has 64-In. Turning Radius

This fork-lift truck called the Hi-Duty has a 64-in. turning radius and is said to meet the needs of many plants who must restrict the operation of heavier trucks, yet are forced to handle loads in the 3000-lb. bracket. Increased hydraulic capacity with single-lever controls and improved steering feature the truck.

Transitier Truck Co., Portland, Ore.

(MORE DATA? CIRCLE FYI 32, p. 145)

Respirator Hood Is Light, Has a 10-In. Window

Said to be light and comfortable, this respirator hood protects against a variety of dusts or gases by means of seven cartridges.

Manufactured of white nylon, olive green twill, or white muslin, the hood provides protection for eyes, head, neck, shoulders, and respiratory organs. A 10-in. window of clear cellulose acetate gives unobstructed frontal vision. The hood is reinforced with leather in four places for long wear and service. An elastic strap sewn at the back of the hood assures a snug fit for various head sizes.

American Optical Co., Southbridge, Mass.

(MORE DATA? CIRCLE FYI 33, p. 145)

Hard Maple and Corn Granules Used as Tumbling Materials

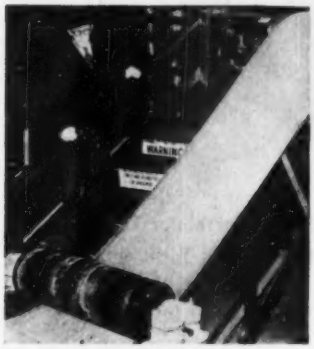
Excellent finishes for metals, plastics, rubber, wood, and similar materials are claimed as a result of processing with a tumbling material made of different grades of hard maple or corn-cob granules.

Kube-Kut is a hard-wood granule which has a high absorptive factor for fluids such as water or oil, is flexible, and not harshly abrasive. Korn-Kob is a dried and pulverized corn cob, tougher and more resilient than maple, though not as absorptive. Korn-Kube combines both the hard-wood and corn granules to provide the physical properties of both.

Kube-Kut, Inc., 635 Midland Ave., Garfield, N. J.

(MORE DATA? CIRCLE FYI 34, p. 145)

Materials and Parts



Top—Lines of force "toe in" as shown by this lucite model. The planar action exerts a centering force on any material passing over the roll.

Side—Pickling-line installation shows how the roll eliminates the need for side guides.

Side Guides on Conveyors Eliminated by Self-Centering Roll

The problem of centering power belts, conveyor belts, or materials conveyed on roller tables without the use of outside guides, is said to have been solved by this roll.

Fundamentally, the unit is a slightly crowned roll, cut transversely at the center. The two halves are fixed to rotate as a unit. The working surfaces of the two parts are approximately horizontal, while the axis are at an angle. In this way, the planes or lines of force in both halves twist evenly toward the center in the direction of movement, conferring a self-centering action on any materials passing over the rolls. In its practical application in the steel industry, it is said that edge and corner damage to sheets, strip, and plates can be eliminated, since there is no longer a need for table guides.

United States Steel Corp., New York.
(MORE DATA? CIRCLE FYI 35, p. 145)

Davis Car-Wheel Boring Tool Uses Solid-Carbide Blades

Railroad-car-wheel boring tools equipped with blades of solid tungsten carbide are being offered by Davis Boring Tool. Four cutters are used in rough boring, two in finish boring, and a single cutter for chamfering. It is said that longer cutting life can be expected with the solid blades, because there are no brazing strains often found in inserted tipped tools. The extra rigidity makes possible higher speeds and feeds.

The cutter slots are held to a tolerance of 0.001 in. The blades are ground to 0.0005-in. fit in the holders to insure full bearing contact. Adjustment of cutters is through a graduated main screw operating an expanding wedge. The operator reads the number on the axle indicating the turned diameter and then sets the cutters through the micrometer markings on the graduated screw. As much as 1⅛-in. diametrical adjustment is possible. With slight modification, other applications such as gear hubs can be bored.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
(MORE DATA? CIRCLE FYI 36, p. 145)

... INCLUDING

Hidden-arc welding system employs small-diameter wire and high currents for deep penetration ..... page 138

Collet chuck and bar feed, actuated hydraulically, provided for screw machines ..... page 139

Tube bearer uses a rotating profile spindle on tubing after it is bent ..... page 140

Roller bearing, cageless, is so constructed that roller can not skew ..... page 142

Drop hammers have an air-operated dog attached to the rocker to control the stroke .... page 144

Drawing press uses fluid action to reduce the eccentric stroke, increasing spm ..... page 148

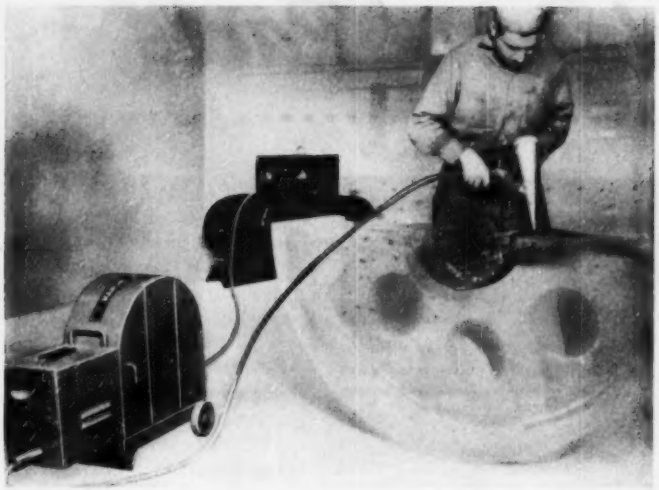
Cage nut locks in place by dropping it over two prepunched loops, eliminating retainers ..... page 150

NEW BULLETINS for your Shop Library, including a 28-page catalog covering a line of adjustable drillheads ..... pages 145 and 146

... and in October 16

THE SHOW IN PRINT, a preview of new equipment to be shown at the **Metal Show** in Chicago October 23-27 . . . including a line of **cored forgings.**

Molding press for plastics has two 50-ton transfer rams, and averages 27 to 31 cph.



Hidden-Arc Welding Process Uses High Current Density

A hidden-arc welding process has been developed which uses either a 3/32-in. or a 5/64-in.-diameter electrode wire at weld currents up to 600 amp. This current operating on the small cross-sectional area produces high current densities. These high densities in turn create a deeply penetrating arc which allows the use of high welding speeds. This also means that, in general, little or no edge preparation of joints is required, and therefore less weld metal is used in completely fusing the joint than previously required.

The feed mechanism automatically feeds wire at a preset arc voltage from the reel through the conductor cable to the welding gun. It is then fed through the gun to the work. The gun holds inorganic granular flux which is deposited around the arc, completely covering it and the crater, as the gun is moved over the joint being welded.

Lincoln Electric Co., Cleveland 1, Ohio

(MORE DATA? CIRCLE FYI 37, p. 145)

Crankcase-Oil Tester Based on Light Transmission

This photoelectric crankcase-oil tester is designed to measure the light transmisison of a thin layer of oil as an indication of its degree of contamination by carbon, metal, and other particles. It is intended for gasoline and diesel engines of the automotive as well as stationary types.

For operation, the tester can be connected either to an ac power line or to an automobile battery. It can also be furnished with a built-in dry-cell battery.

The measurements are based on the action of the light upon a self-generating photocell of the dry-disk type. A few drops of oil are placed in a cuvette which consists of an optically flat glass disk that is cemented into a metal ring. A shallow recess of a fraction of a millimeter is thereby formed by the ring being higher than the glass. Light from a 6-volt bulb is projected upward, passes through the cuvette and oil, then through an orange filter, and finally impinges upon the photocell. Three cuvettes are available having recesses of 0.5, 0.2, and 0.1 mm. Selection of the cuvette depends upon the degree of contamination of the sample. In all, the tester covers a range of 0.001 to 1.0% carbon as encountered in practical work.

Photovolt Corp., 95 Madison Ave., New York 16, N. Y.

(MORE DATA? CIRCLE FYI 38, p. 145)

Ranges for Motor Testing Put In Hand Tachometer

The Metron Type-25D hand tachometer has speed-measuring ranges of: 100 to 1000, 200-2000, and 500-5000 rpm and fpm; and 10-100, 20-200 and 50-500 fpm. These ranges are suited for speeds encountered in motor and generating testing, process control, and maintenance work. Adapters extend the range to as low as 20 rpm and as high as 50,000 rpm.

Other features include: quick response—can be used for acceleration test, self-calibrating check circuit, and low operating torque.

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.

(MORE DATA? CIRCLE FYI 39, p. 145)

Air-Motor Arbor Stand Does Light Production Jobs

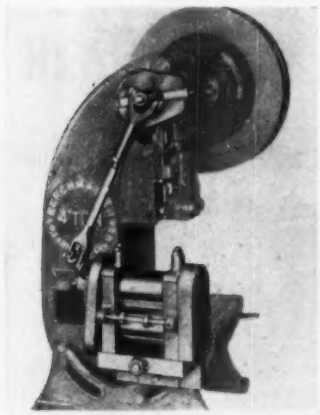
This arbor stand makes a light-duty air press out of a standard air motor. It consists of an upright arbor in a base, which can be purchased separately or assembled.

The controlled thrust and controlled piston speed available from the Bellows air motor, with its built-in valve and speed controls, provides

a range of pressures from a few pounds up to a third of a ton, depending on the model used and the air pressure applied. The top flat surface of the arbor stand has sufficient space for mounting a limit switch for electrical operation. All base plates are interchangeable, thus enabling set-up time on different jobs to be held to a minimum by changing bases without disturbing fixtures. By changing the air pressure, the weight on the end of the piston rod, and the speed-control adjustment, it may also be used as an impact press.

The Bellows Co., Akron, Ohio

(MORE DATA? CIRCLE FYI 40, p. 145)



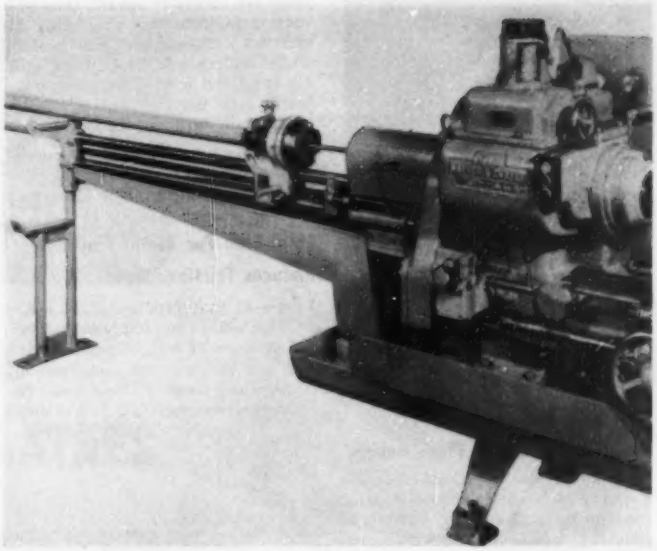
Friction Roll Feeds Adaptable to Most Presses

Expanded line of four automatic friction roll feeds will handle stock in widths of 3, 5, 7, and 9 in., respectively, with an adjustable stroke of from 0 to 3 in. Maximum thickness capacity is 3/16 in.

Adaptable to fit virtually all presses, the feeds are equipped with an angle bracket which mounts to the press bed or bolster plate, permitting vertical adjustment to align rolls with the die. Geared rollers increase pulling force and accuracy. The rolls are driven from a special crankshaft adaptor attached to the end of the press crankshaft, opposite the flywheel. This adaptor is equipped with a T-slot, in which the crank pin can be set for any desired throw within its range. The crank is linked to the friction clutch and roll mechanism through an adjustable-length shaft. Direction of feed is reversible, and can be either push or pull in action.

Benchmaster Mfg. Co., 2952 West Pico Blvd., Los Angeles 6, Calif.

(MORE DATA? CIRCLE FYI 41, p. 145)



Hydraulic Collet Chuck, Bar Feed Speeds Production Cycle

Hydraulic collet chuck and bar feed is offered as a standard accessory for the firm's No. 3, 4, and 5 turret lathes. The design involves a stand, a chuck-type bar-feed head, a control valve with a single all-purpose lever, and associated hydraulic equipment.

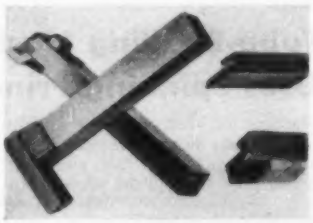
After a bar has been loaded in the stand and the chuck jaws are properly set, a forward pull on the headstock-mounted control lever actuates the hydraulic mechanism to advance the bar for a distance determined by the position of the stroke-adjusting nuts against a scale. When the lever is pushed away from the operator to close the collet hydraulically and reverse the pusher-head travel, the bar-feed head strips back off the stock. The lever then automatically returns to a central, neutral position.

The bar-feed chuck jaws are manually adjusted with a wrench for the proper degree of gripping and the collet is adjusted in the usual manner. A direct-reading pressure gage atop the headstock indicates the degree of collet tightness to aid the set-up men.

The unit provides a fast-acting, positive bar feed under fingertip control to speed the production cycle.

The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

(MORE DATA? CIRCLE FYI 42, p. 145)



Bokum Lathe Tools Have Carbide In Tipped Position

Cutting blades in these Bokum lathe tools are locked in the holders at the proper cutting and clearance angle, obviating the necessity of reworking the angles while the cutting blade is being resharpened. Maximum resistance to chip-load pressure is derived by tipping in a position similar to that on screw-machine tools.

Six models comprise the line: Style R for roughing, Style SF for semi-finishing, Style F for finishing and straight shoulder turning, Style CO for cutting off, Style TH-S for threading, and Style TH-A, also for threading. All models are in three sizes. Blades are available in high-speed steel and carbide tips.

Bokum Tool Co., Detroit, Mich.

(MORE DATA? CIRCLE FYI 43, p. 145)

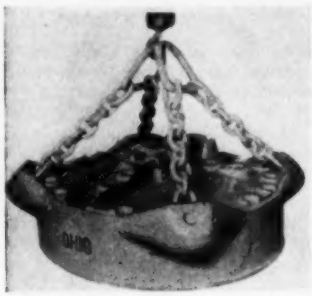
Four-Way Rotary Tool Features Off-Center Flute Design

This rotary tool with an off-center flute can be used for countersinking, chamfering and burring, valve seat finishing, and center reaming.

Named the Quad, the tool is suitable for speeds from 25 to 75 sfm, and can be operated dry at relatively low speeds. Use of a water-soluble coolant or cutting oil is recommended, however, for top finishes. It may also be used by hand for light chamfering operations. Necessary changes for some seat finishing and center reaming jobs will be incorporated in the countersink upon request.

M. A. Ford Mfg. Co., Inc., Davenport, Ia.

(MORE DATA? CIRCLE FYI 44, p. 145)



Ohio "Basket" Lifting Magnet Put Out in 55-In. Size

Ohio "basket" lifting magnets feature an outer ring cast in one piece with four integral ears which project beyond the outer-ring circumference and protect the magnet from damage. It is suspended on four alloy-steel chains attached to the ears.

A 55-in. model, it is similar in construction to the 65-in. Ohio magnets. They are carefully sealed, thus preventing malfunctions commonly associated with magnets that breathe while cooling off. The lifting coils are insulated with a heavy-duty asbestos tape that remains unaffected by heat or hard knocks.

Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 45 p. 145)

Solid Film For Metal Finishing Reduces Friction, Wear

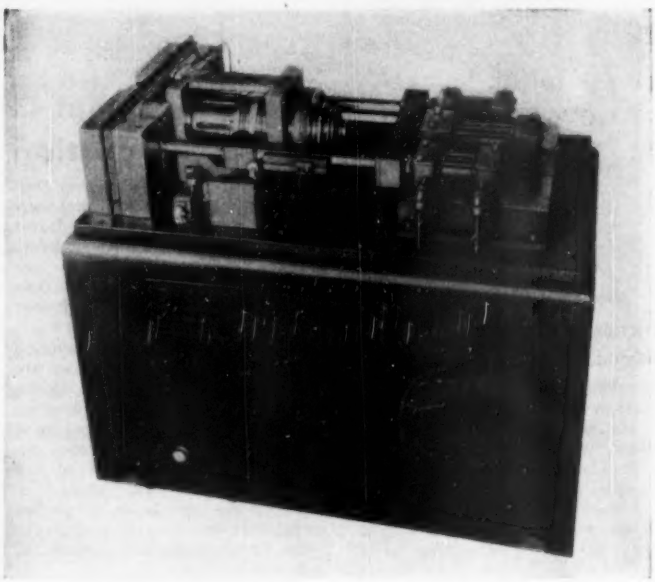
Processes that produce a solid film or "dry" lubricant impregnated into the surfaces of metals, plastics, rubber, and ceramics are now reducing friction and wear, making metal finishing more successful. It is claimed that the highly desirable characteristics of graphite are retained throughout wide ranges in temperature, in a permanent film that is unaffected by exposure to solvents or weather.

These processes have already proved valuable in reducing wear in internal combustion engines and other moving parts. They are being used in disk clutches, brakes, worms, gears and splines. Electrical and aviation industries are using them to reduce erosion and corrosion.

Electrofilm graphite processes will be available either on job work handled in the manufacturer's plant, or, if volume warrants, on a licensing basis with the firm's technical advisory council.

Metal Finishing Div., Pyrene Mfg Co., 10 Empire St., Newark 5, N.J.

(MORE DATA? CIRCLE FYI 46, p. 145)



Tube-Beading Machine Uses Spinning Principle

Machine for beading tubing after it is bent has been developed using a spinning principle. Two electronic motors, one 7½ and the other 10 hp, power the unit. The tube is held stationary by blocks in the die while the profile spindle is rotated off center to form the bead. The height of the bead is controlled by the distance the profile spindle is rotated off center. A limit switch controls this distance, and the profile spindle has a ½ in. throw off center and a one-shot oiling system.

The base is of all-welded steel construction with starters, relay switches, and control valves mounted inside. The time cycle has a potential of 1200 cycles per hour, it being adjustable by a flow control valve.

Gibbons Machine Co., Tipp City, Ohio

(MORE DATA? CIRCLE FYI 47, p. 145)

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Assure accurate, economical, speedy production with minimum maintenance attention . . . automatic lubrication is provided to headstock, gear box, apron, carriage bed ways and cross slide. All mechanisms are completely enclosed giving rigid, compact design and top quality product.

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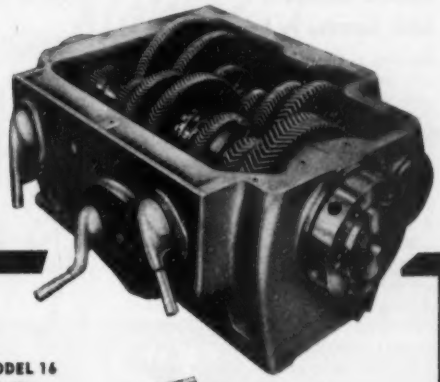
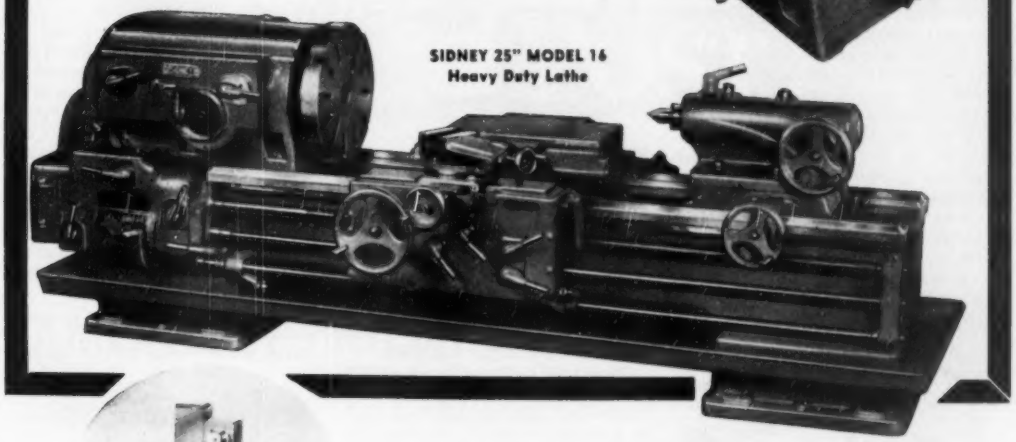
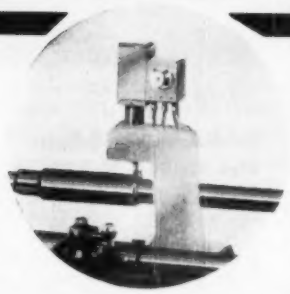
SIDNEY HERRINGBONE GEARED

SIDNEY
HEAVY DUTY LATHES





SIDNEY 25" MODEL 16
Heavy Duty Lathe



SIDNEY FLUID TRACER

The all-hydraulic control for reproduction of work pieces from flat or round template or regular lathe work without limiting range. It eliminates single purpose tools . . . saves on original investment. No parts to replace or remove for change-over to standard lathe operations.

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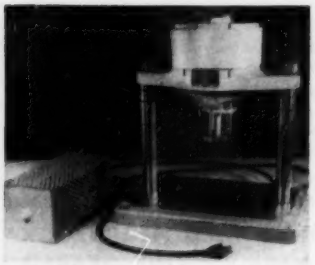


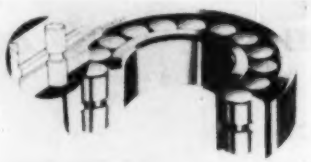
Electric Hammer Adds Squeeze to Impact

Known as the Electropress, this electric impact hammer delivers an impact up to 6000 lb, and then follows through with a squeeze of 2000 lb at the end of the stroke. Both impact and pressure may be controlled with the addition of a unit which will deliver any desired impact from a light blow to its rated maximum.

It utilizes rectified 115-volt ac current as the source of power and converts this directly to linear thrust through a large coil mounted in a cast-steel yoke which acts on a flat, slotted armature.

Coarse adjustments on the spindle are obtained by removable ¼-, ½-, 1- and 2-in. collars on the post. Fine adjustment is provided by threads on the spindle giving microadjustments up to ⅜ in. A positive stop permits fine adjustment of depth of tool penetration. Maximum length of stroke is 1¼ in., and working height below spindle in the up position is 4¾ in.

Black and Webster Inc., 30 Pleasant St., Needham 92, Mass.
(MORE DATA? CIRCLE FYI 48, p. 145)



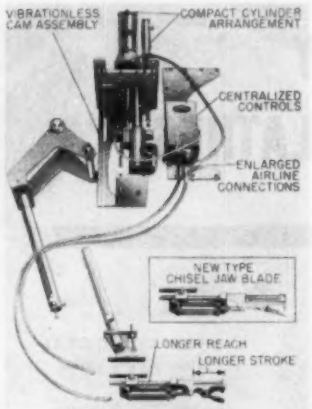
Cageless Roller Bearing Eliminates Skewing

This cageless roller bearing is said to eliminate roller skewing. The outer race is constructed with a tapered guide rail on the inside diameter of the outer race, and a retaining ring is snapped over the opposite side of the roller grooves to make the assembly self-contained. Rollers are grooved to match the guide rail.

According to the manufacturer, rollers in this bearing cannot skew and remain in a cocked position. Right angle alignment of the rollers to their direction of travel is automatically maintained by momentary guide rail and groove contact when tendency to skew arises. Elimination of all end washers permits the use of extra-long rollers in this bearing, giving support to the full width of the races.

It is claimed that this bearing can be mounted successfully in any position from horizontal to vertical.

Bearing Div., McGill Mfg. Co., Valparaiso, Ind.
(MORE DATA? CIRCLE FYI 49, p. 145)



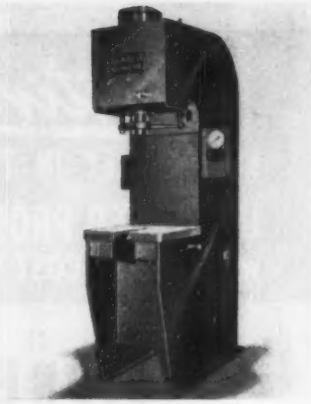
Iron Hand Press-Unloader Has Longer Stroke, Reach

The Iron Hand, built to automatically unload stamping presses, has been redesigned to have a longer stroke and a longer reach. It is thus able to handle a greater variety of stampings, and the addition of larger models facilitates the handling and turning over of the larger stampings.

Cycle time has been increased 20% by enlarging airline connections; strokes per minute range from 12 to 20. Distance between cams has been increased without increasing the overall width of the assembly, adding stability to the swinging arm. A limit switch stops the press midway in its down stroke if the jaws do not retract properly.

All controls have been relocated in one control box. The need for lifters in the die has been eliminated, in most cases, by a blade in the jaw which chisels the stamping out of the die and lifts it vertically over the gage pins. Models with power-cylinder strokes of 20 and 24 in. have been added to models with strokes of 10 in. and 16 in.

Sahlin Engineering Co., 267 Ferndale St., Birmingham, Mich.
(MORE DATA? CIRCLE FYI 50, p. 145)



Hannifin Forcing Press Has Simplified Design

Low cost is said to result from a simplified design for Hannifin 10-ton hydraulic forcing presses.

Known as the F-101, the press is floor mounted, with an 18 by 20 in. table, 36 in. above the floor. Standard models have a 3 in. U-slot in the table. Daylight is 22 in.; reach 10 in.; maximum stroke 12 in. An adjustable relief valve makes it possible to set maximum pressure at any point from 10% of capacity to full, 10-ton capacity. The return stroke is adjustable so that cycle time can be reduced on applications where a full stroke is not needed.

Manual single-lever control is standard, but other controls are available. Also to be had is a differential circuit which doubles approach speed without limiting feed pressure or return speed.

Hannifin Corp., 1118 S. Kilbourn Ave., Chicago 24, Ill.
(MORE DATA? CIRCLE FYI 51, p. 145)

Swedish Vernier Calipers Give Accuracy to 0.001 in.

Vernier calipers from Sweden now available here give positive accuracy to 0.001 in. for outside, inside, depth, and thread measurements from 0 to 6 in. Precision-ground measuring surfaces are glass-hardened and lapped.

The precision-fit sliding head allows no play. The Baltic caliper has an ⅛x⅝-in. ground bar of Swedish steel.

Transocean Trading Co., 1511 N. Gardner, Los Angeles 46, Calif.
(MORE DATA? CIRCLE FYI 52, p. 145)

Stamping a New "Buy Sign" on the minds of 14,000,000 Buyers

THE SATURDAY EVENING **POST**

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Can you find the clue...

...to quality?
✕ marks the spot...

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You don't have to be a super-sleuth to detect the sign of quality on a modern product. Just look for Phillips Cross-Recessed-Head Screws. Used on everything from refrigerators to cattle troughs, these famous screws make possible strap-iron tightness at all fastening points. They're your assurance that a product is well built.

PHILLIPS Cross-Recessed-Head SCREWS on sale at hardware, automotive and mill supply outlets.

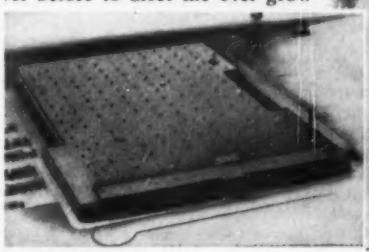
For years, American has been a "PHILLIPS-HEADquarters" . . . engineering these modern fasteners into all types of products.

Today, American joins in this new campaign in which millions of users of manufactured products are being told to look for the clue of extra quality...

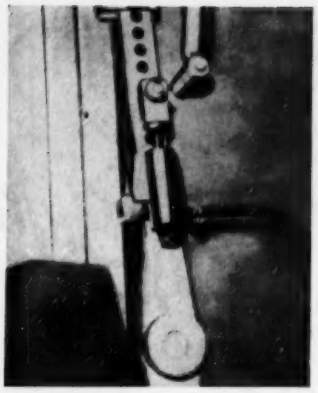
"The Phillips Cross-Recess Marks the Spot . . ."

A symbol that quality is built into a product with the modern Phillips fastener.

American, with its new plant and equipment at Willimantic, Connecticut, is in a stronger position than ever before to meet the ever growing demand for Phillips fasteners. In addition, the facilities at its Norristown, Pennsylvania, plant and the large warehouse stocks maintained in Chicago have been established to help service distributors and users of American Phillips Cross-Recessed-Head Screws. Write, telling us how American can be of help to you!



AMERICAN SCREW COMPANY
Plants at Willimantic, Conn., and Norristown, Pa.
Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.



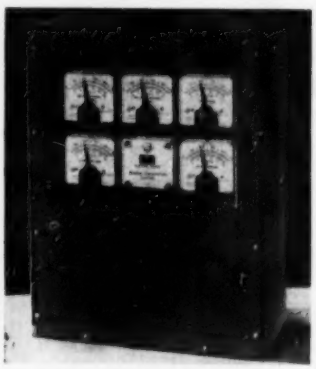
Hammer Strokes Controlled By Air-Operated Dog

The ability to change from full stroke to short stroke or vice versa at the will of the hammerman is provided in Chambersburg hammers, of 1000 lb and up.

An air-operated dog attaches to the rocker which in turn controls the action of the valve. Pressure on a pushbutton on the treadle changes the stroke. It can be arranged so that either the short or the long is the normal stroke. Release of the button reverts to normal stroke. There is no drag, so that both short and full strokes fall freely.

Chambersburg Engineering Co., Chambersburg, Pa.

(MORE DATA? CIRCLE FYI 53, p. 145)



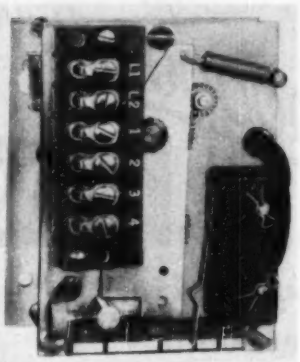
Bearing Temperature Meters Operate by Remote Control

Multiple-meter controls give remote indication of bearing temperature, providing automatic alarm, machine shut-down, or automatic correctives, in case of excess heat. Any number of bearings may be protected, and a separate meter with thermocouple is used for each bearing or other point to be monitored. Meter-relays are calibrated in degrees of both Fahrenheit and Centigrade.

The control unit consists of a metal cabinet with hinged front panel on which are mounted all components. These consist of a transformer and rectifier power supply to provide current for the relays, the load relay, and any other equipment required for the installation. The cabinet has knockouts for a conduit on four sides. Between control and machine no mechanical linkage is used. To indicate running time in hours, a meter on the panel is employed. Three sizes of the meter relay are available: 2⅝ in., 3¾ in., and 4½ in.

Assembly Products, Inc., Chagrin Falls, Ohio

(MORE DATA? CIRCLE FYI 54, p. 145)



Telechron Motor Powers Delay Timer

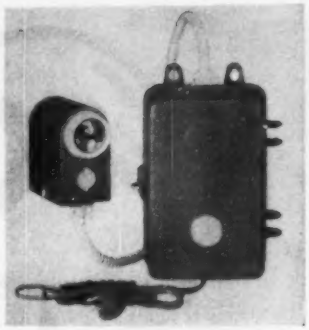
This resetting delay timer is said to answer many requirements for a dependable, simple, synchronous motor-driven time delay for use in electrical and electronic apparatus such as elevator controls, machine tools, and signal systems.

Powered by a Telechron motor, it utilizes a tripping arm which is driven through a train of spur gears. A single-pull double-throw switch either opens or closes an auxiliary circuit. Resetting is instantaneous, accomplished by means of an electromagnetic coil which clutches and declutches a trip-locking gear as required.

Timer is rated for operation from 115 V or 230 V; 25, 50 or 60 cycles. A line of standard ranges from 0.75 sec to 30 min is available.

Automatic Temperature Control Co., Inc., 5212 Pulaski Ave., Philadelphia 44, Pa.

(MORE DATA? CIRCLE FYI 55, p. 145)



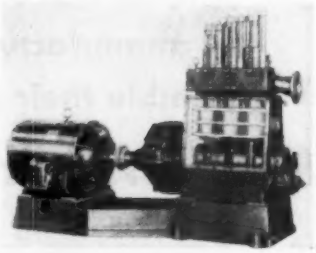
No Wiring Required For Photoelectric Counter

No wiring is necessary in this photoelectric-counter set. The control is powered through line cord with a male plug connection which fits any standard lighting outlet. This also supplies the power for the light source, electric counter and photoelectric scanner, all of which have cables and plugs for connection to the control.

Speed of operation is up to 600 counts per min. The operating range is 10 ft. between photoelectric unit and light source.

Photoswitch Inc., 77 Broadway, Cambridge 42, Mass.

(MORE DATA? CIRCLE FYI 56, p. 145)



Direct-Flow Pump Gives Higher Volumetric Efficiency

Direct-flow principle is employed in this pump, which features lower operating and maintenance costs. The innovation in design reduces the space between valves, thus providing higher volumetric efficiency. Also included is a sectionalized fluid end, composed of separate units—the working barrel, stuffing boxes, valve units, plunger, and suction and discharge manifolds.

The hydraulic medium handled can be water, soluble oil in water, or hydraulic oil.

The Aldrich Pump Co., Allentown, Pa.

(MORE DATA? CIRCLE FYI 57, p. 145)

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For details on an advertised product, write the page number in one of the boxes provided, adding the advertiser's initials if more than one advertisement appears on the page—if the page is unnumbered, as a cover or insert, or the ad shows several products, use initials and write in the product name. Fill in your name, title and address, cut out the card, add a 3-cent stamp and mail. We do the rest, saving you time, trouble, and money. Use this card for requesting manufacturers' literature or more details on new equipment. →

NEW BULLETINS

MACHINES AND ATTACHMENTS

1 GRINDERS—*Mattison Machine Works, Rockford, Ill.*, 16-page bulletin pertains to the company's Plano-Type surface grinders which can be furnished with either a horizontal or vertical spindle. Contains full details and specifications.

2 SHAPERS — *Western Machine Tool Works, Holland, Mich.*, 8-page booklet describes a line of 12- & 15-in. shapers with 18 speeds. All features and specifications are included.

3 KEYSEATERS—*Mitts and Merrill, Saginaw, Mich.* 12-page catalog deals with a line of keyseaters to cut keyways or grooves of various sizes or shapes. Contains specifications, table of cutting time, and a chart showing types of keyways that can be cut.

4 GEAR SHAVERS—*National Broach and Machine Co., Detroit 15, Mich.* 8-page bulletin illustrates the Model GCI gear-shaving machine for gears from 3/16 to 220 PD. Contains specifications.

5 BORER—*Ex-Cell-O Corp., Detroit 32, Mich.* 2-page folder describes a precision boring machine for either general-purpose work or as a single-purpose high-production unit.

TOOLS AND ACCESSORIES

6 DRILLHEADS—*U. S. Drill Head Co., Cincinnati, Ohio.* 28-page catalog contains illustrations and descriptions on drillheads with various numbers of heads for reaming, facing, tapping, and threading.

7 MICROSCOPE—*The Gaertner Scientific Corp., Chicago 14, Ill.* 8-page bulletin presents a toolmaker's microscope, two models of which have not been previously described. Shows optical system used, and contains specifications.

8 RECESSING—*The Maxwell Co., Bedford, Ohio.* 8-page manual describes

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the use of recessing tools for internal-forming operations on automatics, and shows features of newly designed recessing tools with their specifications.

9 GAGES—*The Bristol Co., Waterbury 20, Conn.* 32-page bulletin gives information on the company's Series 500 recording gages. Measuring elements, operating principles, recording charts, and accessories are described.

10 ABRASION TESTER—*Taber Instrument Corp., North Tonawanda, N. Y.* 6-page folder describes a test instrument designed to evaluate the resistance of surfaces to abrasion.

11 OPTICAL MEASURER — *National Tool Co., Cleveland 2, Ohio.* 8-page folder gives data on an optical instrument for measuring lengths, widths, circles, radii, and angles on small parts.

PLANT SERVICE EQUIPMENT

12 TRAMRAIL—*The Cleveland Crane & Engineering Co., Wickliffe, Ohio.* 12-page booklet contains engineering data and description on a line of overhead materials-handling equipment, including tramrail, cranes, hoists, and gantrys.

13 CASTERS — *The Rapids-Standard Co., Inc., Grand Rapids, Mich.* 36-page catalog CT-50 describes a line of casters, floor locks, wheels, and platform and hand trucks. Construction details and specifications are included.

14 PNEUMATIC CONVEYING—*Conveair Corp., Pittsburgh, Pa.* 12-page bulletin 103 describes pneumatic conveying systems utilizing low pressures—each cu ft of air bearing an automatically adjusted burden.

15 FORK TRUCKS—*A & A Machinery Corp., Brooklyn, N. Y.* 8-page folder gives details on various new and used materials-handling equipment, including fork trucks, hand trucks, and trailers.

16 SEPARATORS — *Dings Magnetic Separator Co., Milwaukee 46, Wisc.* 8-page catalog illustrates and describes a line of non-electric magnetic separators. Selection information and specifications are included.

17 CABLE HOISTS—*The Ohio Electric Mfg. Co., Cleveland, Ohio.* 8-page folder covers the company's line of Bobcat heavy-duty electric cable hoists. Gives specifications, prices, and ordering data.

18 FIRE-HOSE COUPLINGS — *Hose Accessories Co., Philadelphia, Pa.* 6-page bulletin 7 covers a line of couplings, spanners, nozzles, and other accessories. Contains tables of thread data.

PARTS AND MATERIALS

19 HIGH-TEMP ALLOYS — *Haynes Stellite Co., Kokomo, Ind.* 68-page catalog gives engineering data on, and describes the various Stellite, Multimet, and Hastelloy alloys. Numerous graphs illustrate physical properties.

20 V-BELTS — *Durbee-Atwood Co., Minneapolis, Minn.* 40-page catalog contains engineering data and drive selections for general-duty and multiple V-belts. Also calculations, comparison charts, and correction factors.

21 HYDRAULIC CYLINDERS—*Hanna Engineering Works, Chicago 22, Ill.* 28-page catalog 233-A has specifications; design, construction, and operation features; and suggestions for uses of high-pressure hydraulic cylinders.

22 TUNGSTEN—*Fansteel Metallurgical Corp., No. Chicago, Ill.* 24-page booklet on tungsten and molybdenum. Covers physical, mechanical, and chemical properties; metallurgy; uses and applications; and other data.

23 RESOLVERS—*Arma Corp., Brooklyn 32, N. Y.* 12-page bulletin describes electrical resolvers for the solving of trigonometric problems.

24 COUPLINGS — *Dynamatic Corp., Kenosha, Wis.* 16-page booklet illustrates and describes a line of water-cooled, electro-magnetic, eddy-current couplings for adjustable-speed drives.

25 SHEAVES—*Allis-Chalmers, Milwaukee 1, Wis.* 12-page bulletin covers automatic Vari-Pitch sheaves. Installation instructions and selection charts are included.

MISCELLANEOUS

26 RECORD CONTROL — *Remington Rand Inc., New York 10, N. Y.* 80-page catalog describes the Kardex visible-control system for the keeping of business records. Shows and specifies the various equipment needed for the system.

27 MAINTENANCE—*McNally Pittsburg Mfg. Corp., Pittsburg, Kan.* 32-page catalog covers a line of heavy-duty equipment from stock or made to order. Includes bearings, pumps, and valves.

28 SCREENS—*The Patterson Foundry And Machine Co., East Liverpool, Ohio.* 24-page brochure on Gyrocentric screens for wet and dry separation of chemicals, rock, abrasives, paint, and other materials.

29 RESEARCH—*Foster D. Snell, Inc., New York 11, N. Y.* 20-page brochure describes the firm's laboratory facilities and equipment, and shows how their chemists and engineers can serve the small manufacturer.

30 FOUNDRY MOLDS—*Bakelite Div., Union Carbide And Carbon Corp., New York 17, N. Y.* 16-page booklet describes the Croning process for producing foundry molds and cores.

10 MILLION GALLONS OF Lusol SOLUTION

HAVE REVOLUTIONIZED SHOP THINKING

ON MACHINE SPEEDS ✓ TOOL LIFE ✓ PRODUCTION COSTS ✓

It is no longer a matter of opinion — 10 million gallons of Lusol solution have been used in exhaustive testing and practical plant applications. It is being used with such success in some of the country's leading plants that they are chary about specific publicity to their competitors.

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Cooling, rather than lubrication, at point of tool contact has made possible 300% to 400% greater speeds, less tool wear, less tool breakage, finer finish, greatly increased production . . . a concept many won't believe until they have tried Lusol . . . a concept Lusol users enthusiastically accept and are using today to their competitors' discomfort.

OPERATORS ARE BOOSTERS

Take the operator who has his hands in coolant all day long — give him Lusol that is clear and clean — like a mild soap solution — no skin irritation — a clean machine — a clear solution that allows him to see his work as the finest drill comes down to the work piece — perfect vision — easier to work with — it changes the whole working aspect of a shop — clothes and shoes no longer soaked in old type coolants. Add to this fewer tool changes, less wheel dressing, far greater speeds, and production picks up with less effort, less operator fatigue. We've never found an operator yet who wants to go back to the "old way."

A bar of 18-8 stainless steel was being cut in 20 minutes. When Lusol was used with the same size bar, same material, same operator, same machine, same tool, the cutting was done in 2 minutes.

Hard to believe, and all Lusol results are hard to believe unless you can accept an entirely new concept of the use of coolants. Lusol cools —rather than lubricates. On the case above, speeds were increased from 30 RPM to 267 RPM. Previously the operator had been breaking tools with fair regularity. Since using Lusol he has broken none. Old type coolants had kept the operator constantly annoyed with skin eruptions. Since using Lusol he has had none.

SOONER OR LATER

Sooner or later someone is going to ask you why you haven't checked into Lusol before. Sooner or later you are going to find out that it does just what the first 10 million gallons have proved. Investigate this way to improve your production NOW. It's more profitable to lead than follow.

LOOK AT THESE FIGURES . . .
THEN SEND FOR THE CASE HISTORIES

BROACHING

- 266% greater production per broach grind
- 275% greater production per broach grind
- 125% greater production per broach grind
- 128% greater production per broach grind

DRILLING & TAPPING

- Saved 70% Drills, 68% Taps
- Tap life increased 1300%
- Drill life increased 3300%
- Saved 90% Drills, 75% Taps

GRINDING OPERATIONS

- Grinding time reduced 25%
- Saved 97½% scrap
- Over 200% more pieces per wheel dressing

Booth 2225 National Metal Congress & Exposition

CASE HISTORIES YOU CAN'T AFFORD TO OVERLOOK

Lusol

SAVES TOOLS ▼ SPEEDS WORK
CUTS COST

NATIONAL DISTRIBUTION . . . WAREHOUSE STOCKS

F. E. ANDERSON OIL COMPANY
222 Brownstone Ave., Portland, Conn.

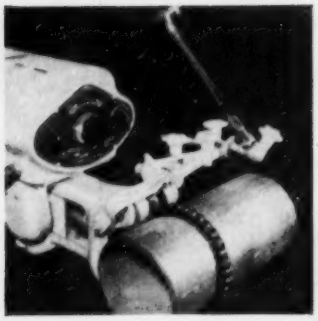
Please send me your case history material on:
☐ Broaching ☐ Drilling, Tapping ☐ Grinding

Name

Company

Address

ZANSO



Pipe-Scarfing Attachment For Kinmont Power Unit

This accessory is said to provide an economical means of accurately cutting or scarfing pipe and tanks while they are being turned by a Kinmont power unit. It is installed through existing bolt holes, without modification or the use of special tools.

Provision is made for vertical and horizontal adjustment of the cutting torch. A protractor dial provides for angular adjustment. The scarfing attachment is hinged to swing the torch out of the way while changing the work, without disturbing the adjustment.

The ¾-in.-ID torch-tip holder is supplied with adapter bushings in sizes of 1/2, 9/16, and 41/64 in. to accommodate the majority of cutting torches in use. Other bushings are available where necessary. The attachment price is $55.

Roylyn, Inc., 718 W. Wilson Ave., Glendale 3, Calif.

(MORE DATA? CIRCLE FYI 70, p. 145)

GE Demagnetizer Takes 8-In.-Wide Stock

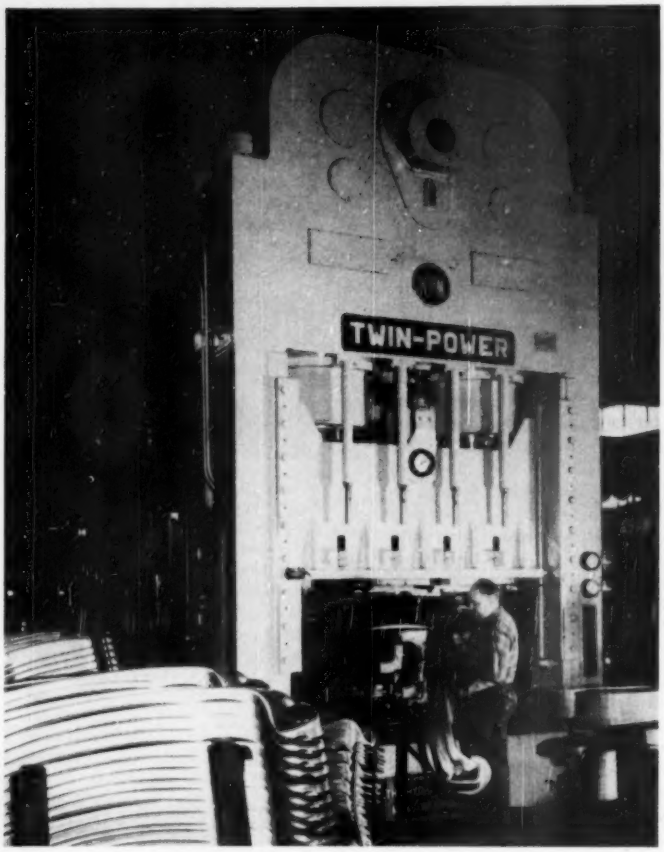
Drills and cutting tools which have become magnetized will collect chips, and then in further use will heat up and become dull.

This instrument is said to be highly effective in demagnetizing materials and stabilizing magnetic flux. The stabilizing comes in when permanent magnets are magnetized to a flux density higher than that required in a finished product. The demagnetizer is capable of reducing the flux density and stabilizing it at the flux value.

The coil is rated at 115 volts, 60 cycles, and is equipped with switch, pilot lamp, and a flexible lead fitted with a standard plug. It has a rectangular opening 4½ in. x 8½ in. wide. Continuous demagnetization may be accomplished by passing a non-metallic conveyor belt through the instrument parallel to the coil axis.

General Electric, Schenectady 5, N. Y.

(MORE DATA? CIRCLE FYI 71, p. 145)



Press Uses Fluid Action To Reduce Crank Stroke

Increases in production up to 50% are said to have been accomplished by this metal-drawing press.

Whereas the conventional mechanical press uses an eccentric stroke equal to the press stroke, in the Twin-Power it is less than half, and is applied only to the lower or work part. The approach part of the stroke is made independently of the eccentric by means of fluid action.

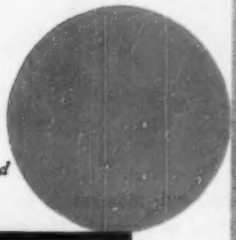
This application is said to result in an increase in strokes per min up to 70% if conventional torque speeds are used, or conversely it decreases the draw speed as much as 45% if the conventional number of spm are desired. The short-stroke eccentric also provides higher tonnage through the greater portion of the working stroke, making it possible to perform jobs on a lower tonnage press.

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

(MORE DATA? CIRCLE FYI 72, p. 145)

Ellstrom

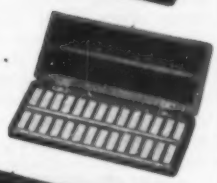
chromium plated gage blocks wear 5 to 20 times longer!

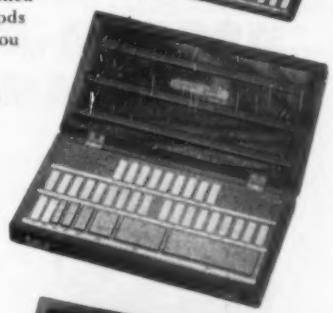


round

square

rectangular





How'd you like to make a big dent in your gage block costs? It's simple. Just specify "chromium" . . . Ellstrom chromium plated gage blocks. They're rated "tops" for all-around gage block quality . . . wear from 5 to 20 times longer than ordinary blocks, yet cost but very little more. Made of the finest materials . . . processed under precisely controlled conditions . . . and finally finished with their extra hard gaging surfaces through methods first developed and perfected by Ellstrom to give you longer wearing millionths.

Ellstrom chromium plated gage blocks are available in 12 standard sets . . . rectangular, square, or round . . . in working, inspection, or laboratory accuracies to meet every gage block requirement. Special sets, metric sets, or individual blocks are also available upon request. And every block in every Ellstrom set carries a positive guarantee of specified millionths to give you the accuracy and uniformity you need.

Ellstrom . . . *measuring in millionths for three generations.*

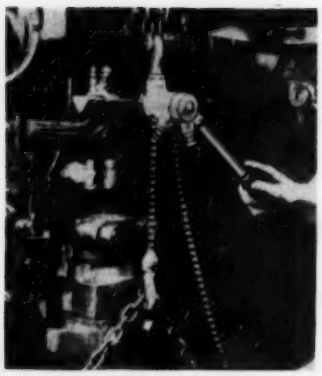
Do You Have the New Ellstrom Catalog? Contains complete specifications and prices on standard Ellstrom Sets . . . plus the new Ellstrom "Build-up" set, Internal Setting Gage, Inspection Service, and Trade-in Allowances. Send for your copy today!

For longer wearing millionths, specify **"Chromium"** . . . **Ellstrom** chromium plated gage blocks!

DEARBORN GAGE COMPANY

22035 BEECH STREET • DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

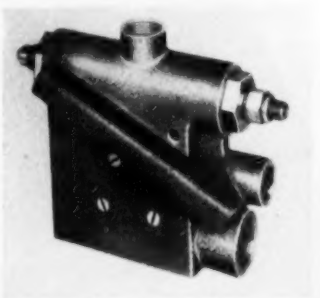


Hand-Operated Hoist Weighs 9½ Lb; Pulls 1000 Lb

This hand-operated puller, called The Mighty Midget, weighs 9½ lb and takes up less than a ft of space, yet handles a 1000-lb load on any lifting, stretching, or pulling job.

The handle serves a double purpose. It may be used as a straight lever when loads are especially heavy, or where lack of headroom allows only partial strokes; or the lower section may be locked at right angles to the upper section to form a crank for high-speed work. Price, for 1000-lb capacity—$27.50. For 500-lb capacity—$19.75.

Coffing Hoist Co., Danville, Ill.
(MORE DATA? CIRCLE FYI 73, p. 145)



Hydraulic-Electric Switch Gives Precise Circuit Control

Cartridge-type electric switch is designed for precise control of electric circuits by means of hydraulic-pressure actuation. This switch will cut in and cut out circuits with as little as 12 to 18% pressure differential.

Unaffected by extreme pressure surges, the unit has also withstood a temperature differential ranging from —65 F to 160 F without loss of accuracy or other desirable operational characteristics. Manufactured within precision tolerances, the design of this unit eliminates failure due to either mechanical or hydraulic shock. It operates immediately with every start of the pump and requires no pressure buildup. Adjustments are quickly and easily made—without breaking the line and with the added feature of preset switch limitations if desired.

Hydraulics Division, Pantex Mfg. Corp., Box 660, Pawtucket, R.I.
(MORE DATA? CIRCLE FYI 74, p. 145)

25% Longer Production Life Claimed for Insert Bits

These insert bits are claimed to have 25% longer life than bits formerly used, and as much as double or triple durability on the more exacting jobs. Cold forged by the same process used in forging the firm's line of recessed-head screws, the bits are said to insure a mated fit. In addition, the bits are hardened to an exact degree by a special heat-treating formula.

Design includes a ball-and-spring lock in the head that provides a tight-fitting grip while driving, yet allows quick changing of bits.

Hy-Pro Tool Co., New Bedford, Mass.
(MORE DATA? CIRCLE FYI 75, p. 145)

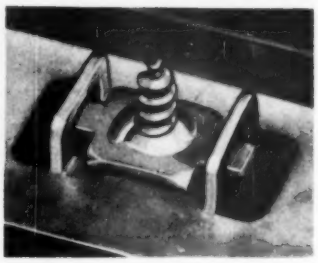
Saw-Tooth Member Adds Safety to Portable Elevators

The portable elevator shown is equipped with a safety device which prevents the platform and its load from dropping if the cable breaks. A vertical saw-tooth member engages a safety pawl which is mounted on the traveling platform.

The cable safety device has been added as optional equipment to three models of 500-, 1000-, and 2000-lb capacity.

Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9, Ill.
(MORE DATA? CIRCLE FYI 76, p. 145)

Nut Locks in Punched Cage Eliminating Costly Retainers



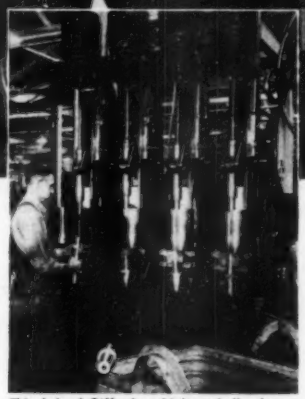
Why spotweld a cage for any floating nut, or why buy costly nut retainers that snap or lock in place, when you can punch a cage right in the sheet metal as a nut holder? This cage nut is locked in place by dropping it under two prepunched loops that are quickly pulled up with ordinary pliers.

The nut is produced to fit most sizes of sheet-metal screws. It is made of spring steel, or can be of mild steel, depending on the torque requirement. A conical-shaped impression is formed in the nut to provide a 360° helical thread-grip on the screw thread.

Prestole Corp., 1335 Miami St., Toledo 5, Ohio.
(MORE DATA? CIRCLE FYI 77, p. 145)

BIG NEW "CAT" MOVES MORE EARTH FARTHER, FASTER

This powerful new tractor-wagon combination, now in production at Caterpillar Tractor Co., is designed for high-speed, long haul, high-capacity earth-moving.



This Leland-Gifford multiple spindle, heavy duty drilling machine is specially tooled for fast, accurate drilling of track roller shafts.

"Caterpillar" also uses Leland-Gifford hydraulic feed, horizontal deep hole drilling machines for cumbersome parts, such as cylinder blocks, oil pans, manifolds, as shown here.

"CATERPILLAR" keeps production moving with LELAND-GIFFORD DRILLING MACHINES

Leland-Gifford drilling machines play a part in the big job of producing "Caterpillar" Diesel tractors and earth-moving equipment. Precision drilling operations including deep hole drilling in crankshafts, connecting rods and track roller shafts move along with speed and efficiency. Several of the Leland-Gifford installations at "Caterpillar" are shown here tooled up for fast work-handling and highly uniform output. Look to Leland-Gifford for the one best machine for every drilling need.

Write for Complete Information

PRODUCTION MEN

Get This Handy Slide Rule

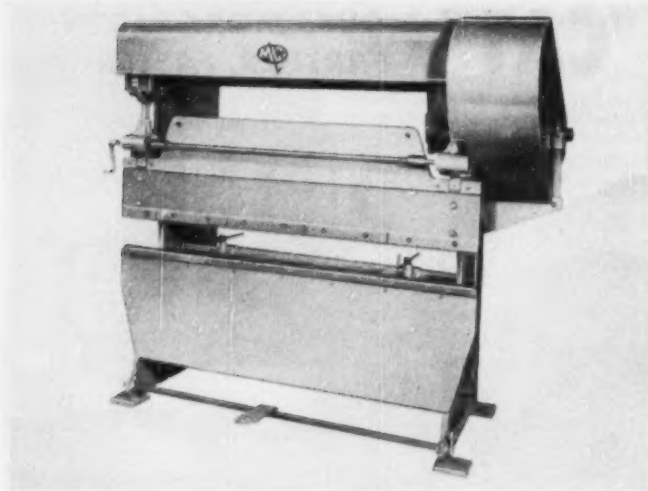
A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 8, 565 W. Washington Blvd.; DETROIT 26, 1533 Penobscot Bldg.; CLEVELAND 1, P. O. Box 5647; NEWARK 2, Industrial Office Bldg., ROCHESTER 4, Commerce Bldg., LOS ANGELES 14, 726 So. Spring St.



Single-Plate Friction Clutch Put in Airtherm Press Brake

A line of press brakes called The Metal Worker has been developed for bending, forming, blanking, or multiple punching.

Features are: all-steel welded frames; single-plate friction clutch integral with the flywheel; single-plate friction brake for positive engagement; positive gibbing, with takeup in all directions; ram adjustment equalizes thrust loads through the use of alloy-steel screws operating with one right-hand and one left-hand thread; and a single through shaft.

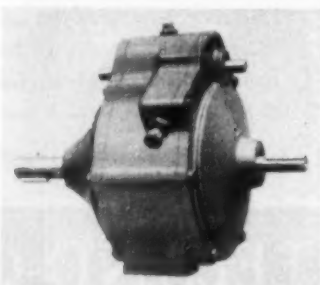
Airtherm Mfg. Co., 763 South Spring Ave., St. Louis 10, Mo.
(MORE DATA? CIRCLE FYI 78, p. 145)

Flanged Miniature Bearing Permits Manufacturing Economy

This flanged miniature ball-bearing is said to make possible substantial manufacturing economies, often permitting substitution of punched sheetmetal housings for expensive, precision-machined castings.

Sizes range from 0.055 in. to 3/16 in. in bore, and 3/16 in. to 5/16 in. in OD, and include both retainer and full-race designs. The outer raceway and OD are ground, the standard material being high-carbon chrome-alloy steel.

New Hampshire Ball Bearings, Inc., X Key St., Peterborough 1, N. H.
(MORE DATA? CIRCLE FYI 79, p. 145)



Snow-Nabstedt Reduction Clutch Designed for Compactness

Said to be the most compact clutch available, this Snow-Nabstedt reduction clutch is 9⅜-in. long, 9¾-in. wide, and 10 13/16-in. high. It has forward, reverse, and neutral operating positions with the axis of the input and output shaft coincident. It can be shifted or reversed under full load. Minimum reduction ratio is 4 to 1, and it transmits 2 to 12 hp.

Roller bearings support the shafts, and the pinions are hardened to 55 Rockwell C. The clutches are furnished for various mounting needs.

Snow-Nabstedt Gear Corp., Hamden, Conn.
(MORE DATA? CIRCLE FYI 80, p. 145)

Bearing-Surface Material Makes Shafts Last Longer

A self-bonding metallizing material is said to increase bearing-surface life as much as 25 times that obtained in any other way.

Known as Spraybond wire, the material is extremely hard, and being microscopically porous, holds lubricants. Application consists of: part is cleaned or undercut, bearing material is sprayed on, the surface finish-ground. Because of the close adhesion of the material to the interface, it also serves as a foundation material for bonding a coating of another metal.

Metallizing Engineering Co., Inc., 38—14 30th St., Long Island City, N. Y.
(MORE DATA? CIRCLE FYI 81, p. 145)

Phillips Soldering Tool Has a Light Beam, 4 Tips

This solderer called the Versa-Tool combines heating elements, transformer, light, two-position switch, and fuse into a single unit. It has four interchangeable tips for various jobs, including the unsoldering of old work.

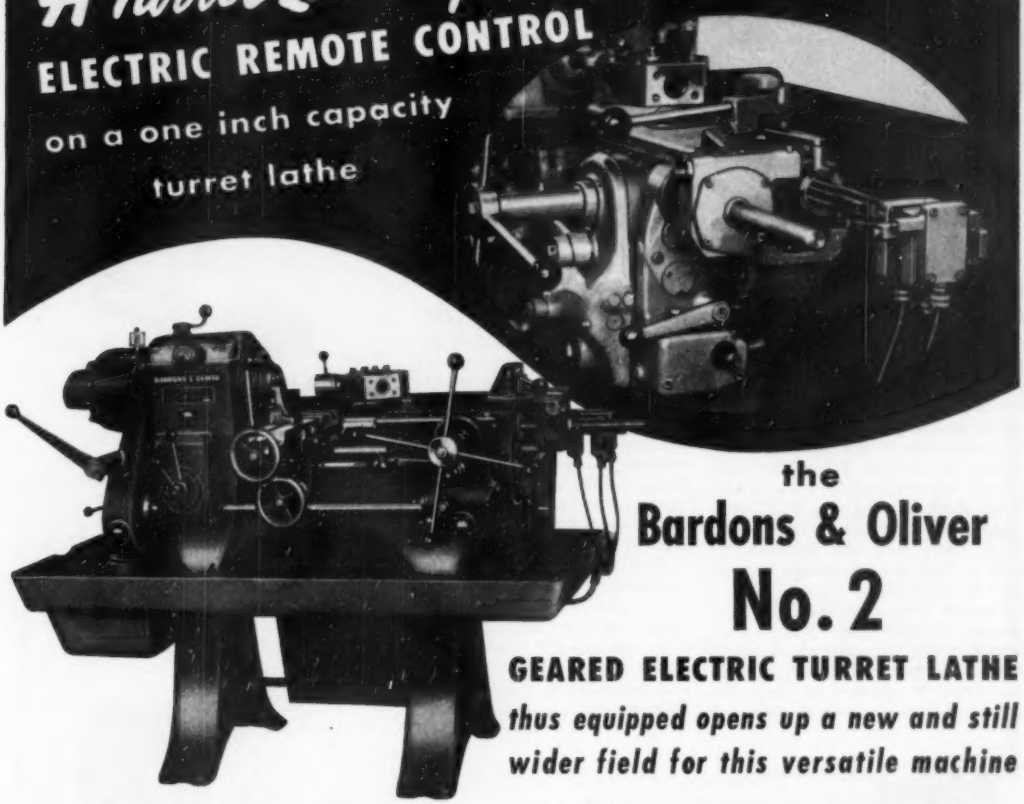
A trigger switch in one position closes the circuit to a light beam, a second position closes the soldering circuit, while maintaining the light. The tool is available in 115 volt, 50-60 cycle for domestic use, and in 220-volt, 50-60 cycle for foreign markets.

Phillips Mfg. Co., Inc., 2816 Aldrich Ave. S., Minneapolis, Minn.
(MORE DATA? CIRCLE FYI 82, p. 145)

NOW AVAILABLE!

A Turret Leading Attachment and ELECTRIC REMOTE CONTROL

on a one inch capacity turret lathe



the Bardons & Oliver No. 2

GEARED ELECTRIC TURRET LATHE

thus equipped opens up a new and still wider field for this versatile machine

• In several prominent manufacturing establishments (names on request), a high degree of accuracy of thread is obtained by this new leading attachment. A conveniently located lever engages the double half nut with the leader. The forward motion of the slide is stopped either automatically by the turret stop screw or manually by the lever.

For tapping, the spindle is reversed automatically by the forward slide movement when the tap reaches full depth. The direction of the spindle rotation is changed again at the end of the rearward slide stroke.

An electric spindle speed change automatically reduces the spindle speed for threading and reaming.

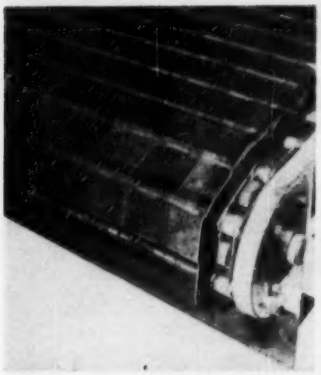
THESE FEATURES MEAN A LARGER NUMBER OF PIECES PER HOUR, A HIGHER QUALITY OF WORK, AND GREATER OPERATOR EASE.

The savings effected by this machine are often sufficient to pay for the entire new machine investment in three years or less.

Manufacturers of Turret Lathes and Cutoff Machines

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

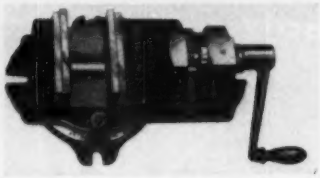


Hinged Conveyor Belting Handles Hot and Heavy Material

This hinged conveyor belting is said to have been developed to facilitate mechanized handling of hot, heavy, or highly abrasive metal parts, scrap, and forgings as well as wet or dry chips. One of the features of the belting is its ease of assembly into almost any required length or width from stock component parts. The links are made from heavy-gage steel plate, and are fastened by rods so that the side chains become part of the belting.

Outside links of the belting incorporate interlocking side wings which remain engaged at all times, even when belting is traveling from one level to another or over the power and idler sprockets. The link and rod design, in conjunction with the side wings, eliminates fall-through. The belting utilizes steel lengths in pitch sizes of 2½, 4, 6, and 12 inches. Widths from 6 in. to 6 ft. can be formed.

May-Fran Engineering, Inc., 1677 Clarkstone Rd., Cleveland, Ohio
(MORE DATA? CIRCLE FYI 83, p. 145)

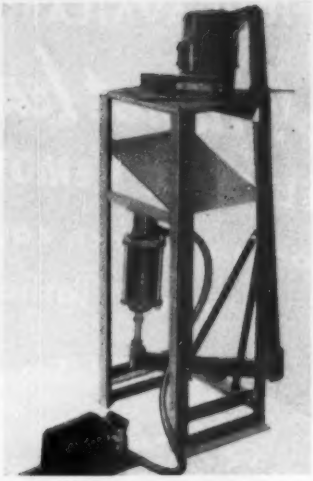


Swivel-Base Vises Have Strong Jaws, Are Cast

These swivel-base milling-machine vises are built of semi-steel castings in three sizes, 3 in., 4½ in., and 6½ in. They employ hardened-steel sliding jaws which have full-length bearing on a ground bar and also on machined ways, which gives greater strength and accurate fit. The 4¼-in. and 6½-in. sizes have a large Acme screw with replaceable bronze nut.

Four bolt and key slots are provided for attaching the vise rigidly to the machine table, so that workholding surfaces of the jaw and body are at right angles or parallel to the table.

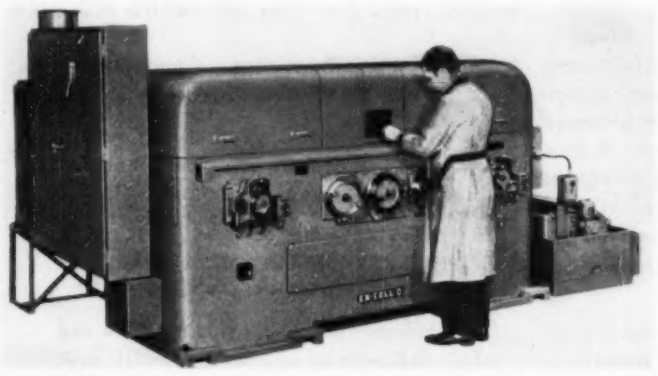
L. W. Chuck Co., Toledo, Ohio
(MORE DATA? CIRCLE FYI 84, p. 145)



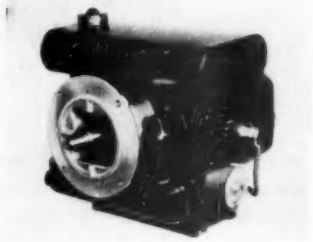
Little Blacksmith Notcher Uses Either Air or Foot Power

This Little Blacksmith notcher can be foot operated or can be air powered by attaching an air cylinder. It will produce a 90° 5x5-in. notch in 16-gage mild steel. Weight is 150 lb. Air cylinder requires only 75- to 85-lb pressure.

J. F. Kidder Mfg. Co. Inc., 368 Colchester Ave., Burlington, Vt.
(MORE DATA? CIRCLE FYI 86, p. 145)



TWO-WHEEL GRINDER simplifies the work of operators in high-production processing of jet-engine aircraft blades. The machine uses two 24-in. diamond-dressed grinding wheels which finish both sides of the root form simultaneously. The blades are held in fixtures which are removable from the machine and may accommodate one or two blades, depending on size. The operator places the loaded fixture on the machine slide, presses the clamp button, then the start button. While one blade is being ground he can remove a finished blade from another fixture and check the finished part.—*Ex-Cello Corp., 1200 Oakman Blvd., Detroit 32, Mich.*
(MORE DATA? CIRCLE FYI 85, p. 145)



Switch to Gas Engine Made Easy by Adaptor Flange

With this adaptor flange, manufacturers of pumps, compressors, generators, and other equipment will be able to offer customers the option of either gasoline or electric power units. Users of existing equipment will be able to switch quickly as conditions make one or the other unit more desirable.

The flange will fit the mounting provided for direct-connected electric motors of frame sizes 43 to 49, and operating at 3450 rpm. Made of aluminum, it is available in two sizes.

Power Products Corp., Grafton, Wis.
(MORE DATA? CIRCLE FYI 87, p. 145)

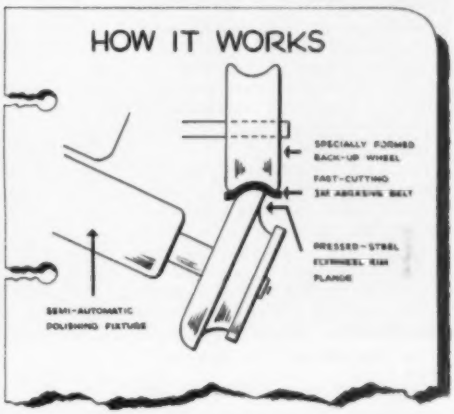
"Formed-wheel" belt grinding cuts 3-step job to one!

SEMI-AUTOMATIC polishing fixture spins and turns 20" pressed-steel wheel against fast-cutting belt. Savings with 3M Abrasives soon pay for equipment and automatic fixtures. Belt back-up wheel is specially formed to mate with curve of flywheel flange. Formed-wheel belt grinding can cut *your* grinding costs, too!

3M Abrasives slash grinding time 71% at American Type Founders

Time study figures prove it! Formed back-up wheels and 3M Abrasives are saving American Type Founders $1.15 on every "Little Giant" press flywheel they finish. A one-step operation now gives these wheels a smoother, cleaner surface in only 7¼ minutes instead of 25 minutes with the former 3-step method.

Diagram below shows how formed back-up wheel matches the contour of the flywheel rim, gives uniform results, saves 71% on time alone.



You can make savings in time and money on *your* heavy grinding and finishing by consulting one of our experienced Methods Engineers. Just write Dept. MF-105 for this service offered at no cost, no obligation.

WE INVITE YOU TO USE OUR DEMONSTRATION ROOMS . . . work out faster, more economical grinding and finishing methods. A 3M Methods Engineer will grind your sample parts on modern belt grinding equipment, show you how to cut costs. For nearest location, address Dept. AM-950

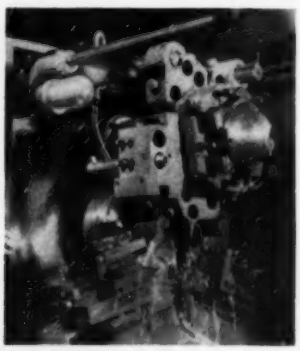
Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives.
General Export: Durex Abrasives Corp., New Rochelle, N. Y.
In Canada: Canadian Durex Abrasives Ltd., Brantford, Canada.

High-Volume Vapor Collector Reduces Upkeep, Fire Hazards

High-volume self-contained collector for vapor and mist, the model VC-5, is equipped with a motor-mounted starting switch and drain spout for returning collected condensate to the reservoir of the machine, or to waste, as desired.

Developing 3600 cfm at 5-in. water lift through an 8-in. inlet with its 5-hp motor, it can be used effectively with screw machines, centerless grinders, and chucking machines. Vapor mist is condensed by a non-inflammable spun-glass filter, which has long life and can be replaced easily.

The Aget-Detroit Co., Ann Arbor, Mich.
(MORE DATA? CIRCLE FYI 88, p. 145)



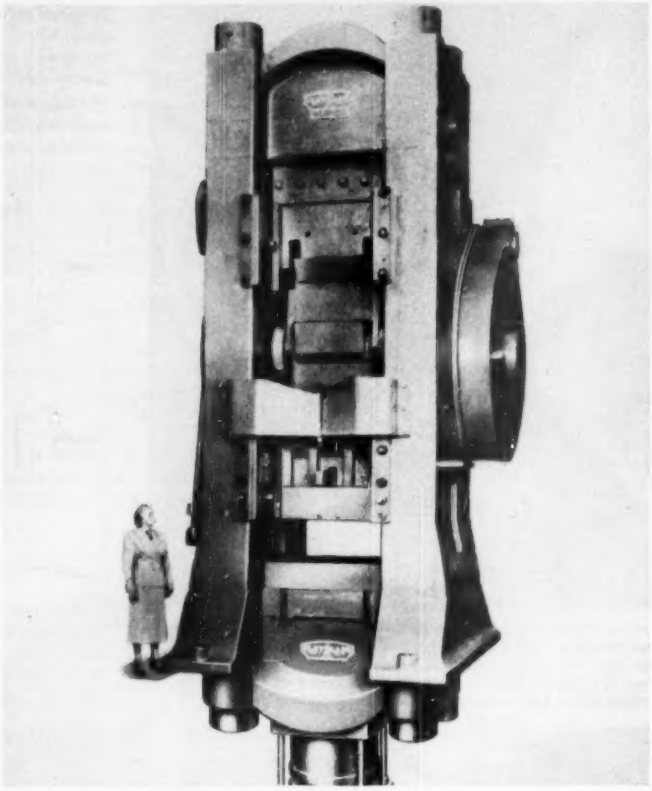
Single-Spindle Automatics Broaden Threading Performance

Two optional arrangements are offered in these single-spindle automatics that are said to broaden the threading performance. One of these provides an intermediate-slip, reversing main-drive motor, so solid taps or die heads may be used as well as the self-opening type.

This innovation involves no mechanical changes in the machine; tapping torque is maintained in proportion to the capacity of the main drive motor and the speed of the spindle. A fixed trip on the machine's pentagonal selector drum actuates a limit switch ordinarily used to cut in a late cross slide, but which in the tapping cycle is used instead to reverse the motor. When the motor reverses, the tap feeds out of the work at the prescribed rate and the machine then cuts back into rapid-traverse reverse. Feed range by change gears is the same as the standard machine, from 0.002 to 0.083 in.

The second arrangement combines the use of a reversing motor with a feed and threading transmission incorporating two additional planetary shifts, so that a wider range of threads may be cut, either right or left hand.

The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio
(MORE DATA? CIRCLE FYI 89, p. 145)



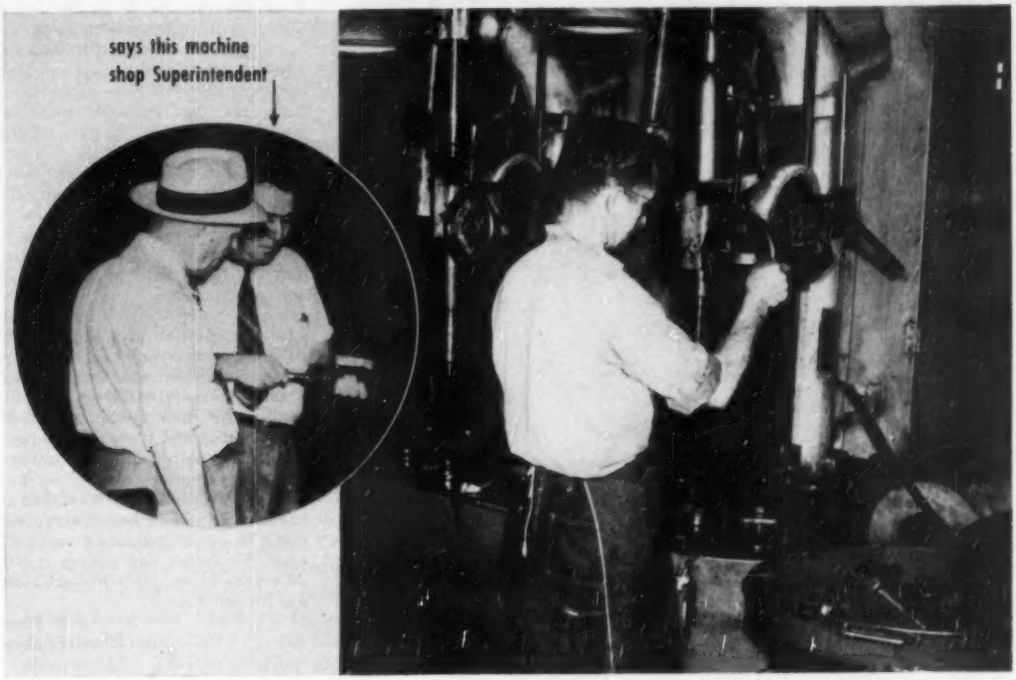
Knuckle-Joint Press Has 2500-Ton Capacity

This knuckle-joint press with a capacity of 2500 tons, is equipped with an air friction clutch, and a bar knockout in the slide. Double-geared with twin-drive, the unit is arranged with an air cushion on the bed and with pads on the uprights and rear of the slide for a mechanical pick-off attachment. The cushion has a 50-ton capacity at 75-lb air pressure, and a 3-in. travel.

The stroke of the slide is 10 in., while the shut height is 30½ in. The face of the slide is 30 x 36 in., as against the area of the bed, which is 42 x 48 in. The slide can be adjusted ½ in.

The Cleveland Punch & Shear Works Co., Cleveland, Ohio
(MORE DATA? CIRCLE FYI 90, p. 145)

"We get longer tool life, better finishes with GULF LASUPAR CUTTING OIL



"We've found Gulf Lasupar Cutting Oil—blended with Gulf Cut-Aid—the practical answer to our reaming problems," says this machine shop Superintendent. "On these cast iron cylinders, for example, we're getting better finishes than with the oil we used previously, and rejects are negligible. And we've been able to increase tool life substantially. The reamers for this job have been used constantly for seven eight-hour shifts and are still in perfect condition."

These are typical of the results obtained with this effective combination in scores of progressive machine shops. Gulf Lasupar Cutting Oil is specially compounded to make it exceptionally active over the entire range of a cutting operation. Gulf Cut-Aid gives improved flushing action, adds to cooling properties, and helps increase penetration and wettability.

Let a Gulf Lubrication Engineer show you how Gulf Lasupar Cutting Oil and Gulf Cut-Aid can help you increase tool life and improve finishes. Write, wire, or phone today.

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GULF BUILDING, PITTSBURGH, PA.
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GULF INDUSTRIAL LUBRICATION

PRECISION LAPPING *plus* PRODUCTION SAVINGS!

with the new method **Lapmaster "48"**

- **The lapping plate of the LAPMASTER is automatically conditioned during the lapping cycle . . . no lost time for re-surfacing.**
- **The LAPMASTER quickly laps any soft or hard metals of various sizes and shapes . . . it handles many metal and non-metal parts never before finished by precision surface machines (ceramics, plastics, etc.).**
- **The lapping cycle of the LAPMASTER is automatically controlled . . . skilled labor is not necessary.**

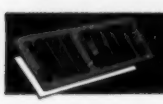
This revolutionary lapping machine answers your need for obtaining precision surfaces at a low production cost. It is easily accessible, simple to operate, and permits continuous lapping without the necessity of down time for lap reconditioning. Its entire operation is automatic—the lapping cycle is timed, and "wet" compound is distributed to the lapping plate via the feed track in exactly proper amounts.

In one cycle, the Lapmaster "48" will precision-lap such diversified work as hydraulic parts, torque converter parts, bearing faces of pump gears, mechanical seal parts and gauge blocks—all to a flatness of .0000116" and a surface finish of 2 RMS or less. Its efficiency is so great that users have found that it is frequently faster than both the grinding and de-burring operations which it usually eliminates.

The Model "48" Lapmaster has a 48" lapping plate. Other models are manufactured with plate diameters of 12", 24", 36", 48", 60" and 72".

The Model "12"...designed for lapping small parts up to 4¼" in diameter.

Write, on your letterhead, for a copy of our new, illustrated Lapmaster booklet: Crane Packing Co., Dept. AM10, 1836 Cuyler Ave., Chicago 13, Ill.



CRANE PACKING COMPANY
LAPMASTER DIVISION • CHICAGO 13, ILL.

ROUND TABLE *Discussion*

BROTHER'S KEEPER

THIS QUESTION must be discussed, with the thought uppermost in the mind that the executive is standing midway between the mechanic and the company who employs them both. He must therefore view the question with a judicial eye. I think that it will be agreed that if the mechanic in question has the ability to become a good workman who can be trusted to do a precision job, in 99% of cases he has the ability to be trusted, not to do petty pilfering, either from his mates or the company employing them.

I have noticed in my 36 years of supervising, that good and skilful mechanics invariably were the men of the best character in the Tool Room. One could tell them from the neatness of their clothes and from their clothes and from their department. The petty pilferer is always, without exception, a man or boy who is slovenly in his dress and in his speech, and in consequence not much to be desired as an acquaintance. Therefore, the answer is NO, do not start him, unless you are looking for trouble.

J. P. Essex
Hove, England

•

COST SHARK

THERE SEEMS to be no good reason why the men should consider they are being "clubbed" simply because an estimated price has been fixed for a job. Likewise, there seems to be no reason why the men should be told that a price *has* been fixed, if it is not a piece-work shop. If the men are working on a time rate basis they are not likely to be interested in costs or prices. That is, or should be, the foreman's and the manager's headache. In general production shops not operating on a piecework basis, few foremen concern themselves about costs and prices, but all of them should be made acutely aware that minimum *times* are looked for on all jobs. That, to readers in America, may seem to be elementary but as a result of long experience in handling foremen in several engineering shops in Britain, it is, to me, a melancholy reflection that a surprisingly small proportion of foremen in non-piecework shops are sufficiently alive to the vital im-

Parts for NEW "Caterpillar" Tractors machined by KENT-OWENS

New "Caterpillar" Diesel DW20 Tractor and W20 Wagon hauling heavy clay.

After five years of research, testing and proving—"Caterpillar" has announced two great new Tractors . . . and Kent-Owens Milling Machines help to save production costs.

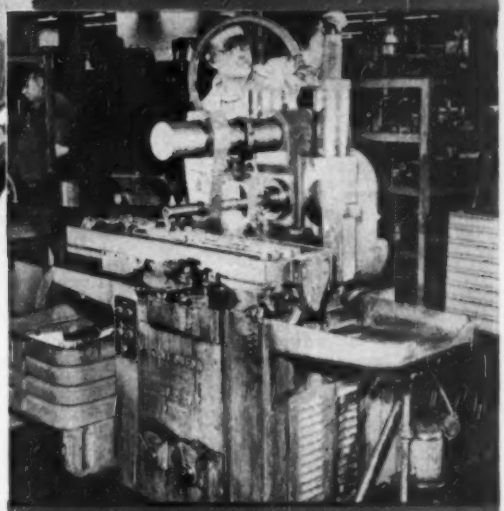
These new "Caterpillar" products are high-speed, long haul and high-capacity earthmoving machines built by Caterpillar Tractor Co., Peoria, Ill. The new units are a four-wheel Diesel tractor-wagon combination, the "Cat" DW20 Tractor with W20 Wagon; and the powerful two-wheel Diesel prime mover, the "Cat" DW21 equipped with the No. 21 Scraper.

The Kent-Owens Machine in the upper photo is milling bearing lock slots in connecting rods and caps. Due to the flexibility and ease in setting up Kent-Owens machines, the Caterpillar Company have found these machines can be easily adapted for a wide variety of operations. The machine in the lower photo is used for milling operation on compression release levers, clutch control levers, governor control levers and bell cranks. Write for Bulletins. Also, let our engineers help you with tooling and special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.

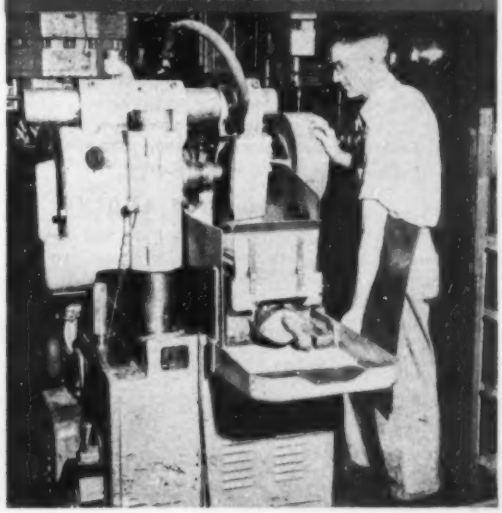
Call on

KENT-OWENS

for Milling Machines



Here are two Kent-Owens No. 2-20 Milling Machines in use at Caterpillar Tractor Co. These milling machines have 42" x 12" table, and 20" table travel.



A REVELATION
in hand hoist performance
YALE LOAD KING

***EASY** to move around*

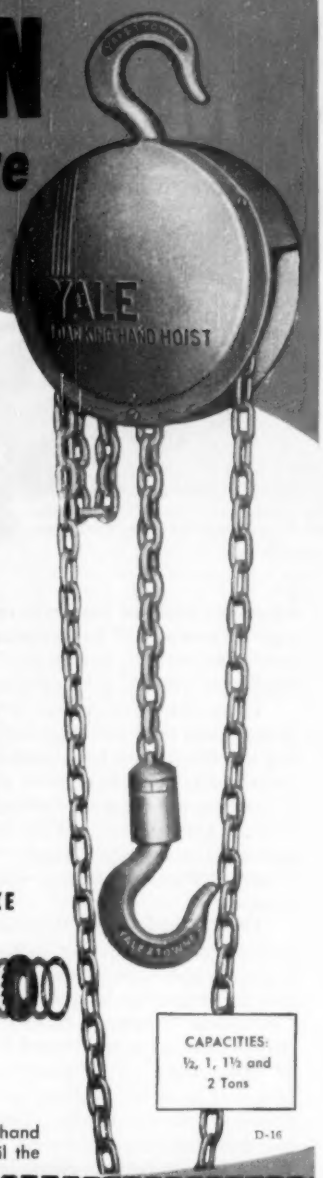
Portable. ½-ton model weighs only 37 lbs.! High strength aluminum alloy castings and alloy steels, fewer parts—all are combined to provide the compact "carry-around" lightness of the Load King in all capacities.

***FAST** in lifting action*

Up to 95% efficiency! It takes this hoist a mere 20 seconds to lift 1,000 lbs. 3 feet. Only 60 seconds to hoist 4,000 lbs. 2.1 feet. *All* rotating shafts are ball bearing equipped, parts are precision machined, and the powerful, revolutionary new Synchro-matic load brake acts quick as a wink.

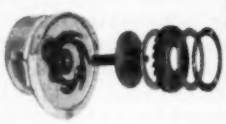
***SAVES** back-breaking work*

Hand pull force necessary to lift the load is maintained at minimum by the high efficiency of this hoist. ½-ton or 2-ton capacity—the Load King is a one-man hoist. Easy lifting keeps operators "in trim" all day. Production hikes, costs go down.



NO OTHER HOIST HAS THIS SYNCHRO-MATIC LOAD BRAKE

Employs a new, improved principle of instantaneous brake action—maximum braking power, automatically! 6-tooth pawl engages 24-tooth ratchet at 6 points simultaneously with balanced and cushioned spring pressure . . . no side pressure on bearing surfaces . . . longer pawl life. Stabilizer ring gives a soft, even, lighter hand chain pull—speeds brake release for precise inching when lowering.



CAPACITIES:
½, 1, 1½ and 2 Tons

D-16

BEFORE YOU BUY ANOTHER HOIST

Investigate fully every feature that makes the Load King your best hand hoist investment. Get all the facts from your Yale distributor or mail the coupon to hoist headquarters. You'll be convinced! So act now!

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☐ Send me Load King Bulletin P-1254.
☐ Give me the name of the nearby Yale distributor.

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Company.....
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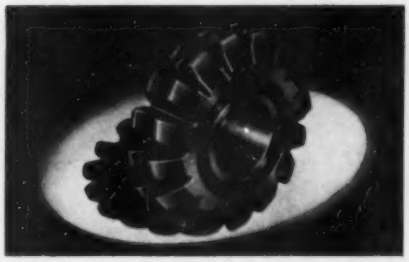
portance of "time taken" to complete a job. Many of them seem to feel that if they can get the work executed accurately, that is all that should be expected of them.

I do not think that a foreman should be asked to *estimate* for work but I do think he should be asked to help in estimating, if only to get him interested in the matter of production times. In small and medium size general production shops the assistant manager may estimate for work and in the process he should make the fullest possible use of the appropriate foreman's experience. This procedure, if adopted, will serve as a useful check on calculated times and often as a corrective, since the foreman will know the machine on which the work should be executed and will be aware of any limiting factors such as age, doubtful accuracy, etc.! all of which have a definite bearing on the rate and quality of the production that can be expected. If an estimator is employed, the assistance of the foreman is still most advisable, because of his intimate knowledge of the plant's strength and weakness and, as stated previously, to make and keep him cost conscious.

If a foreman is asked to help or advise in framing an estimate, such activity will be a help and not a hindrance to him when he comes to do his part if the contract is secured.

In this way he will have been compelled to take an interest and, to at least a limited extent, will have committed himself to times which he feels can be achieved. Were he not consulted he would not feel the same responsibility in the event of the offer being accepted and production times could quite easily suffer as a consequence. Unless a foreman is specially trained—few are in Britain today—it would be quite unfair to ask him to be responsible for an estimate which, in the circumstances, would take up so much of his time as to reflect unfavorably on the main function of a foreman; viz, intelligent, effective supervision.

In my present position as shop manager on general production, few weeks pass without my being called on to estimate for work. The plan I adopt is simple and effective. The work is mostly machining and I spend enough time on an estimate in order that it may serve as a sound basis for a piecework price if business results. The estimated times are calculated from detailed drawings (nothing is guessed). The appropriate foremen are then asked to give what they consider to be reasonable times, and if comparison reveals con-



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Full hardness and maximum toughness result when your high speed steel tools are hardened in Sentry Electric Furnaces using Sentry Diamond Blocks. There's no oxidation, no scaling, no reduction in size. Cutting edges hold up and tools stay sharp longer. Tools may be thoroughly soaked for maximum hardness without danger of burning. Hardening the SENTRY way means lower tooling costs.

METAL SHOW IN CHICAGO
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Visit us at Booth 602 where we will have one of our latest furnaces in operation. Bring samples of your HSS cutting tools for a hardening demonstration.

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The Sentry Company
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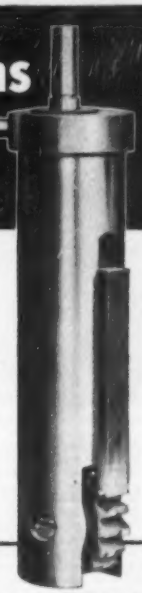
10 Good Reasons
why YOU should use NATIONAL Keyseating Millers on your next job



They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

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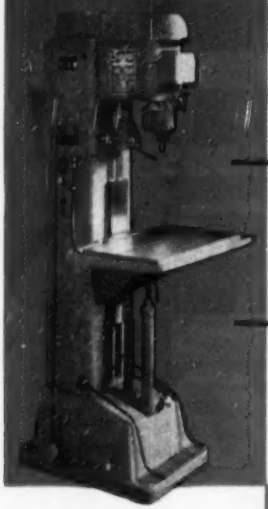
SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production



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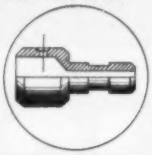
FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

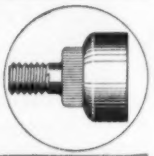


Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine

TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING



3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine

Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

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Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

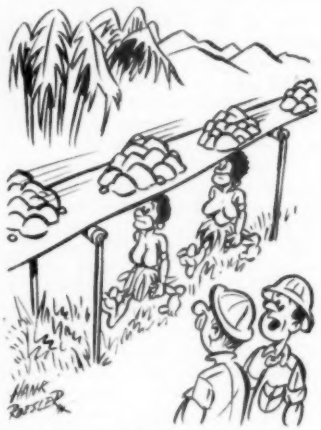
siderable disparity, investigation follows and the point is cleared up.

When satisfied that the times finally decided on are reasonable and achievable, fifty per cent is added to cover piecework, after which the overheads, profit and materials charges are added to complete the offer. If the offer is accepted the estimated times become the piecework times and unless a bad slip has been made, neither the men nor the firm can drop money on contracts so obtained. The only losses so far as the firm is concerned, have been due to faulty material, castings, etc.

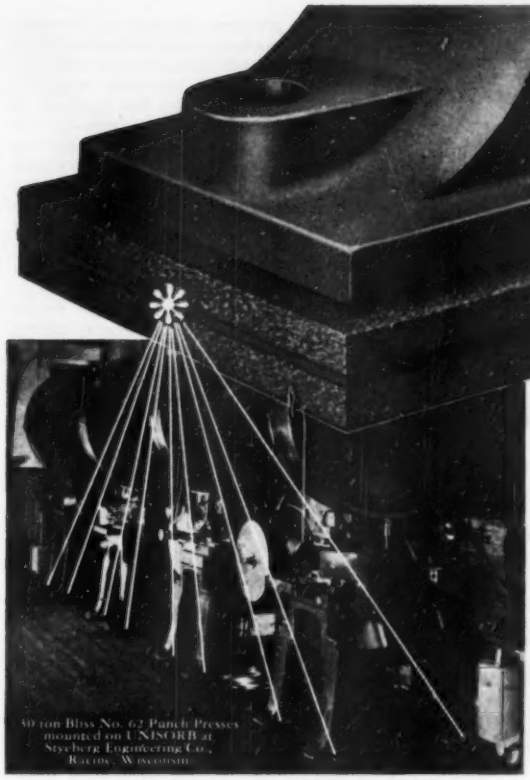
C. A. Mackinnon
Airdrie, Scotland

•

SHAKESPEARE wrote "The whirligig of time being in his revenges." Ed's boss would seem to be confirming this, making the complete somersault. If his policy be sound, as he would seem to think, he should not stop here; that would be but to nibble at a very big apple. He should push on and soon he would have the practice of workshop control back where it was 60 years ago before the time of Taylor. If foremen have time, as well as capacity, to estimate labor costs, good—make them do it—but it must not be overlooked that, to be reliable, estimates must be based on visualized operations and the use of the appropriate special tools, and these may neither exist nor even be designed. Thus for all such estimates to have real value, fairly complete recorded planning would seem to be necessary. Sure, Ed and his confreres will have a busy time but think of the colossal salary savings which would ensue. Gone would be the need for Taylor's method, speed



"We have an awful time breaking them of some of their old customs."



40 ton Bliss No. 62 Punch Presses mounted on UNISORB at Styeberg Engineering Co., Racine, Wisconsin

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...Because There's No DRILLING!

Eliminate Bolts and Lag Screws ... Mount Machinery on UNISORB ®

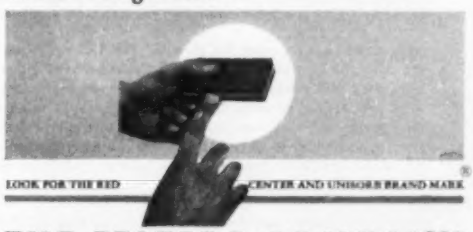
Easy to install, UNISORB-Mounting requires none of the maintenance care and expense you've been used to.

A special cement (we supply it) binds the UNISORB pads to machine feet and floor with a holding strength of 1500 lbs. per sq. foot *minimum.*

And it absorbs from 60% to 85% of transmitted noise and vibration . . . saves floors, building, machinery . . . often permits higher machine speed.

You'll want all the facts handy the next time you move a machine, or add a new machine — *or a new plant* — to your operation.

Write . . . *right now!*



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PRECISION GEARS

(AN ARGUMENT)

Does any mechanism operate at top efficiency when its power is transmitted through inaccurate gears? Then why are you so liberal with the tolerance you allow in the forming of your gears? Wouldn't you rather have precision gears if you could secure them at the same cost?

HERE'S NEWS FOR YOU!

The Hamilton No. 1 Gear Hobber is a machine designed for the forming of small, super-accurate, spur, spiral, bevel, worm, and face gears. (By small gears we mean gears of six inch diameter or less). It is of extra rigid construction, for the maintenance of accuracy, and embodies the unique feature of independent speed, feed, and indexing selection. This last named feature greatly facilitates set-up. In fact, it reduces the time consumed to a point far below what is normally considered minimum.

Thus, as you will perceive, the Hamilton No. 1 Gear Hobber is a machine, the principle of which eliminates the possibility of indexing error; the rigidity of which maintains accuracy and encourages heavy production loads; the setting of which speeds production both by conserving set-up time and by allowing maximum cutting speeds on all materials; and the accuracy of which is reckoned to .0002". If more accurate gears would be advantageous to your operation, you should know more about the Hamilton No. 1 Gear Hobber.

We will be glad to supply engineering information about the application of the Hamilton No. 1 machine to your particular job. Communicate!

Also ask for our Bulletin H 1-49. It illustrates and explains the Hamilton No. 1 machine in detail.

DEALERSHIPS are still available in eight territories. Write for information.

THE Hamilton TOOL COMPANY

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and personnel bosses; for planning, labor and estimating departments; as for scientific management, make the foremen do the job; make 'em work really hard; make 'em produce to their own estimates. If they are unabel to patrol the shops, make 'em walk faster or run. If the resultant output be low and costs high, the usual result of estimates which are to high, sack 'em for inefficiencey. If after trying these almost antediluvian methods Ed's boss meets with failure, he may find himself relegated to the apparent calm of an industrial back-water where, falling into a coma, he may expire.

P. E. James
Lindum, England

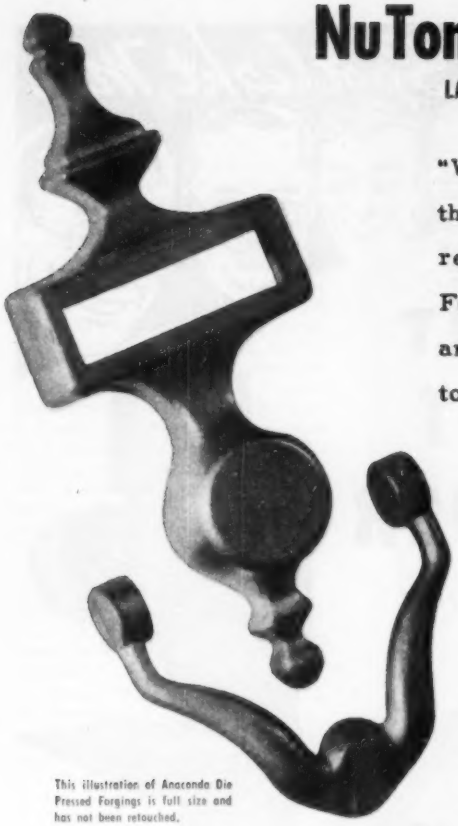
•

CACHE OR CONFESS?

I THINK friend Ed is way up the well-known creek without a paddle if he expects the average machinist to come running to report to him whenever a mistake is made that causes a little work spoilage. Every foreman knows—the human element being what it is—a certain amount of mistakes are made in the machine shop every working day, and much as we'd like to see spoilage reduced to zero, we have to recognize the inescapable truth that "to err is human." One fine foreman with whom I was associated for several years handled this matter of spoiled work by using judgment and a sense of proportion. If the spoiled material could be replaced from stock without too much delay or expense, the workman didn't have to report to him. If the material involved delay or excessive cost it had to be reported at once. The unforgivable sin was to knowingly allow a piece of work to leave the shop or department that did not conform to specifications. The men knew that an honest mistake would not be held against them and governed themselves accordingly. There was no need to hide the spoiled material or attempt to cover one's tracks; a man might be subjected to some goodnatured kidding by the rest of the boys as he threw the spoiled piece in the scrap-bin, but he knew that was the end of it. He went back to the machine and worked as hard as he knew how to make up for it. Morale was high in that shop and spoilage in relation to production was very low indeed. All because this foreman realized the truth of the old saying, "The man who never made a mistake never made anything."

So, while one can sympathize with Ed's desire to check spoilage in the

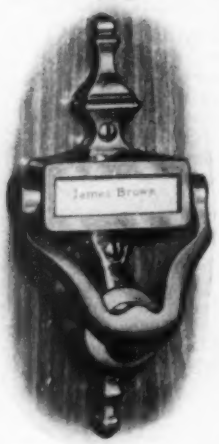
NuTone, Inc., OF CINCINNATI, ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DOOR CHIMES, SAYS:



This illustration of Anaconda Die Pressed Forgings is full size and has not been retouched.

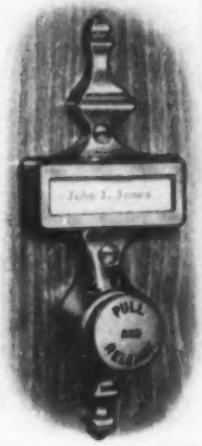
"When we used brass sand castings for these parts, long and costly buffing was required. But these Die Pressed Brass Forgings changed all that. They are amazingly easy to machine ... and polish to a high gloss with a minimum of buffing".

You'll hear the same story wherever a comparison is made. That's because Anaconda Die Pressed Forgings are solid, dense-grained, twice-wrought metal—with double the strength of ordinary sand castings. Forged in dies, they have die-like dimensional accuracy, die-like surface texture that minimizes finishing costs. Publication B-9 goes into detail, telling how, when, why and where. Write for your copy today. Address, The American Brass Company, General Offices, Waterbury 20, Conn., in Canada, New Toronto, Ontario.



NuTone Solid Brass Door Knocker using the two Die Pressed Forgings illustrated above.

NuTone Electric Push Button using same face plate and requiring only a drilled hole in the cored boss and a brass-faced push button.



NuTone Mechanical Door Chime. Same face plate forging is used here, too. The pull and release knob is also a Die Pressed Forging with depressed lettering. Tone-bar and practically all other "behind the door" parts are made of Anaconda Brass.

ANACONDA®

DIE PRESSED FORGINGS

the new DETROIT NUT DRIVER

Never Before
Anything Like It

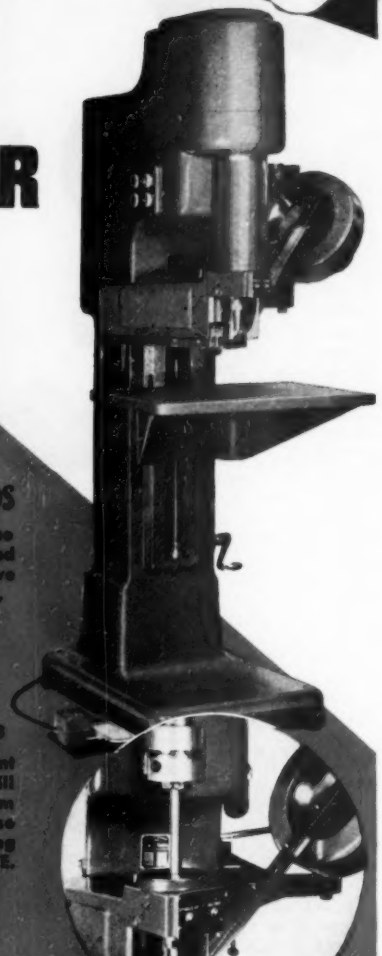
Again the Detroit Power Screwdriver Company leads the way . . . Having whipped the problem of production screwdriving by replacing slow hand methods with magazine-fed power-driven screwdrivers, it now breaks another bottleneck by the introduction of this new Nut Driver.

IT WILL REVOLUTIONIZE NUT DRIVING METHODS

Instead of the previous costly, slow method of placing the nut on the stud by hand and then tightening it by an air or electrically operated hand tool or a hand-operated ratchet wrench, this machine will drive nuts semi-automatically, or it can be set up for automatic operation, entirely eliminating the manual handling of nuts, except to load the hopper which feeds the nuts to the driving spindle. The operator has only to place the assembly on the locating fixture on the work table of the machine and actuate an electric foot switch.

WIDELY ADAPTABLE—*Will Fit Your Requirements*

Capacity: Nuts, 5/16" min. to 1 1/16" max. across flats . . . Equally efficient for special nuts such as Jam, Castellated, Lock, etc. . . . Machine will drive any nut within its range that can be selected and fed in a uniform position. Get our new catalog describing this new Nut Driver, also Power Screwdrivers, Motorized Hoppers and Special Assembling Machines. SEND SAMPLE ASSEMBLY FOR PRODUCTION ESTIMATE.



DETROIT POWER SCREWDRIVER CO.
2797 WEST FORT ST., DETROIT 16, MICHIGAN
Yes, send along your new catalog . . . sounds interesting.

COMPANY NAME_____
BY_____
STREET ADDRESS_____
CITY_____ STATE_____

DETROIT POWER SCREWDRIVER CO.
2797 WEST FORT ST. DETROIT 16, MICHIGAN

shop, his methods are hardly to be recommended. I think if he approached the men in a friendly way he might receive some helpful suggestions. It may be the lighting in the shop is inadequate. If so, an hour or two with a light meter might show results. Or the shop blue-prints need replacing. There is also the possibility that some of the shop tools and measuring devices are not what they might be. How about Ed himself? Is his word of mouth instructions as clear as they might be? Sometimes a foreman has a clear picture in his own mind of what he wants done because he has thought it over carefully until his thought processes have accepted the idea and become familiar with it. But when he tries to impart the idea to someone else he is liable to forget that he is imposing a new idea on the other fellow's mind that must be allowed a certain amount of time and explanation if it is to register clearly. Explain your idea step by step, as lucidly as possible, giving the man an opportunity to grasp it; wherever figures and tolerances enter in, put them on paper as clearly as you know how. When in doubt—put it in writing!

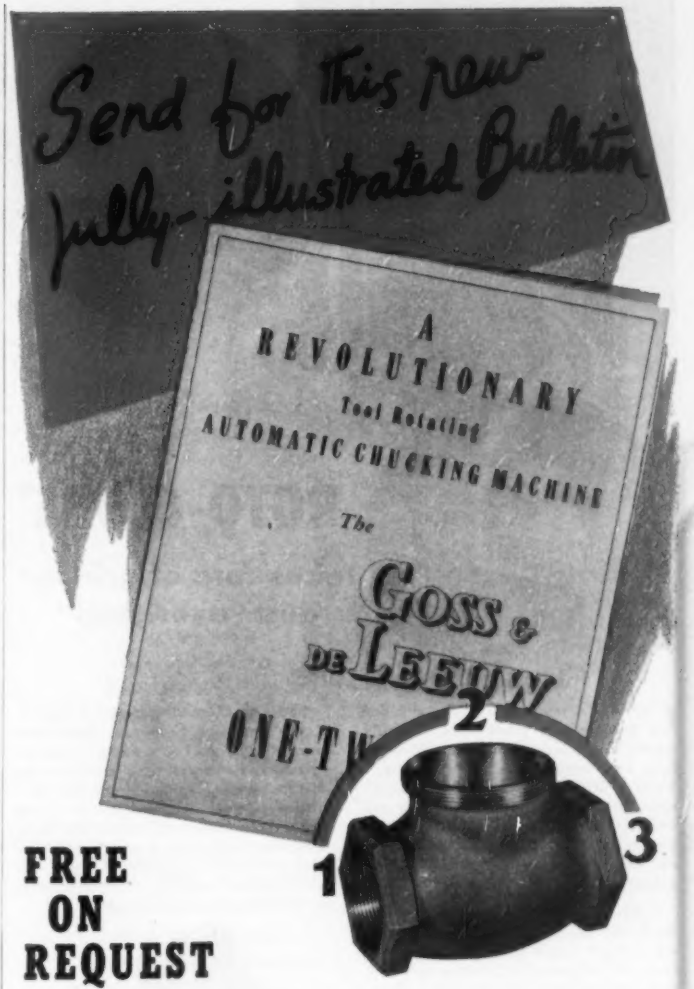
Assuming then, that our friend Ed has checked the elements that contribute to mistakes and work spoilage and has given the tools of production a clean bill of health, including himself, he is left with the shop force to scrutinize. It shouldn't be difficult for him to spot the careless and inefficient and have them mend their ways or send them on their way. He will then have reached the peak of efficient foremanship, lucky man! But will he have entirely eliminated mistakes and work spoilage? Oh dear, no! Little things like Joe Brown having a row with his wife, or young Jones thinking about the blonde in the restaurant that served him his breakfast coffee will conspire to make that shaft too small or break one of the lugs off that casting. Just the human element again.

So cultivate that sense of proportion, Ed, don't have the men running to you with every mistake they make. You'll save time and the men will save "face." They'll work harder for a man than for a stuffed shirt, no matter how full it is of good intentions!

Robert S. Alexander
Greenville, R. I.

•

LOOKING UP from my desk I see a man at the other end of the toolroom, packing his tools. This man is sup-

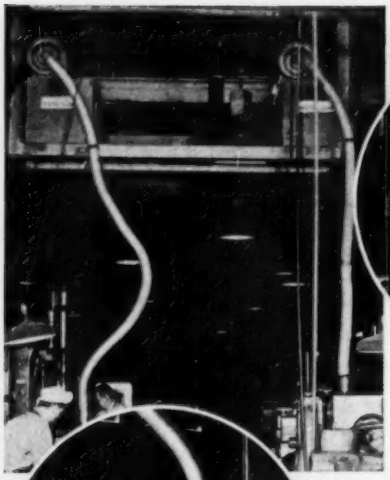


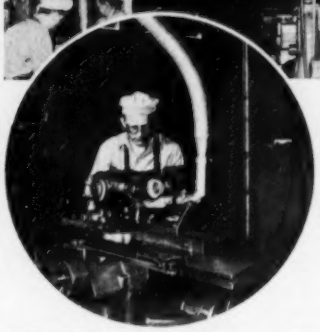
FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.





ROTO-CLONE*

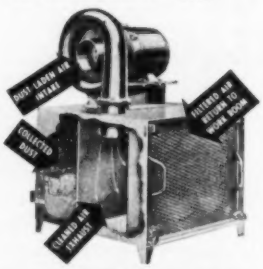
takes care of grinder dust "overhead"

COSTLY "overhead" from grinder dust can be taken care of easily when a Roto-Clone* is installed. Pictured here are two of American Air Filter's Type D Roto-Clones, Self-Contained units, located overhead, away from machines, so valuable floor space is not sacrificed. Two different hood designs collect the dust—one from a shaft grinder, another from a surface grinder.

Dust is drawn into the hopper on which the Roto-Clone is mounted. A drawer in the hopper holds the dust, until it is removed—disposal is simple, safe and fast. Part of this Self-Contained Roto-Clone is a plenum chamber which houses a filter after-cleaner. The exhaust air is filtered and returns as clean air into the work room. Workers' health is protected; heat is conserved; there's more production per machine with Roto-Clone on the job.

*Roto-Clone is the trade mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.

There's a clean saving with a Type D Roto-Clone—the Dynamic Precipitator orginated by AAF engineers. It can be installed as a central system or as an individual unit to serve a single dust-producing operation. If you are not using this method for dry collection of granular dust, then call a dust engineer for complete information, available through your nearby American Air Filter representative or write for Bulletin No. 207.



ROTO-CLONE*
DUST CONTROL EQUIPMENT

AAF
American Air Filter
COMPANY, INC.

207 Central Ave., Louisville 8, Ky. • *In Canada:* Darling Bros., Ltd., Montreal, P. Q.

posed to be working at a lathe on a mold part. I sense trouble and walk toward him, he walks toward me. We meet half way across the shop and he says, "You had better check my tools and let me go." I say nothing but motion him to follow me into the office and we both sit down, then I ask the man what his trouble is.

Half embarrassed, half belligerent, he tells me that he has spoiled the job in the lathe by overshooting his mark making the piece 0.001 in. smaller than low limit. This sounds bad because the piece already has considerable time in it.

Now, things like this have happened before. I know of men having thrown the piece across the shop, in disgust, and then quit. Others I've known to hide or destroy the part and then put in a lot of effort to "sneak finish" another part, hoping not to be discovered—just to save face.

Here is a man who admits his error, he is ashamed of himself and like other mechanics, he is obsessed with a fear that he will be bawled out and fired anyway, so he is willing to quit—especially as he has confidence in his ability to get another job.

Now, should I bawl this man out and fire him, or should I get in there and help him save the piece and his face? After all, my job is to lead and to help the men, in order that jobs get done and delivered to the shipping dept. A bawling out will not get the job done. So I decide to help to save the job if possible.

We go together to the lathe, we check the part print. We check the mikes and then check the piece. We verify the fact that the piece is 0.001 in. undersize

This part has cost us considerable money, but to save it we need time to think—and we can't think straight if we start bawling people out. So we put the man on another job, some other detail connected with the present job—anything to keep him busy—then we take time to study our problem. Usually, there will be a way to save the piece if it is worth saving. Engineering cooperated by altering the size of the mating part which was not yet made up. We return the man to finish the piece to new specifications, with a firm admonition to be careful. He finishes the job, and life goes on.

It is interesting to note how, after this affair was settled, the man rarely hesitates to cooperate when there is a problem regarding spoilage.

The reason why most men hesitate to admit spoilage or errors is the dread of having the boss blow his top. It is up to him to lead men to

a cyclone was the hit of the show!

Back in '35 at the Amphitheatre in Chicago, Lindberg's CYCLONE Furnace was the hit of the show . . . because it brought to every heat treater *a new and better way to do his job!* The CYCLONE Furnace—our first product, was the first practical 100% forced convection furnace. It represents a basic improvement in existing equipment—it has never been successfully imitated.

Through the years we have grown in size and in the scope of the products we produce. We will have the products of eight divisions on display at this year's show—many of these products representing basic improvements in the tools of your trade.

on display:

HEAT TREATING FURNACES
MELTING FURNACES
HIGH FREQUENCY EQUIPMENT
ELECTRICAL EQUIPMENT
LABORATORY EQUIPMENT
AIR & HYDRAULIC EQUIPMENT
FABRICATION
AUTO ACCESSORIES

Be sure to see our exhibit—Booth #1204—National Metal Congress, Amphitheatre, Chicago, October 23—27, 1950

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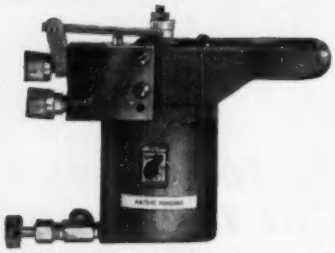

USE A NEW MEAD PNEUMATIC DRILL PRESS FEED FOR DRILLING REAMING TAPPING

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines — increases production substantially on suitable jobs: double or more in some cases.

Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and break-through cushion. Quick return. Easy to synchronize with automatic cycle equipment.

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Write today for latest complete catalog.

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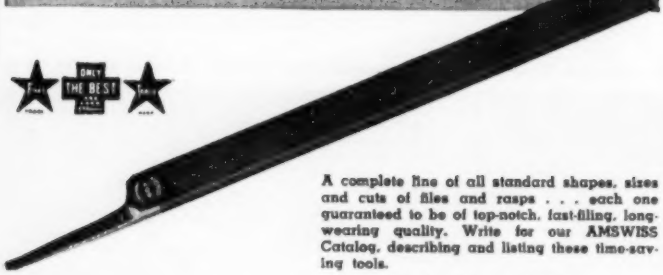
Amswiss

AMERICAN-PATTERN FILES



A complete line of all standard shapes, sizes and cuts of files and rasps . . . each one guaranteed to be of top-notch, fast-filing, long-wearing quality. Write for our AMSWISS Catalog, describing and listing these time-saving tools.

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Also manufacturers of Swiss-Pattern files, milled curved tooth files, rotary files, and mechanics' hand tools.

keep cool when such problems arise because an upset reaction is very contagious and other men besides the one in question will be affected. Also it's a good way to avoid ulcers.

Henry George
Dayton, Ohio

•

LITTLE PLANT SCHOOLHOUSE

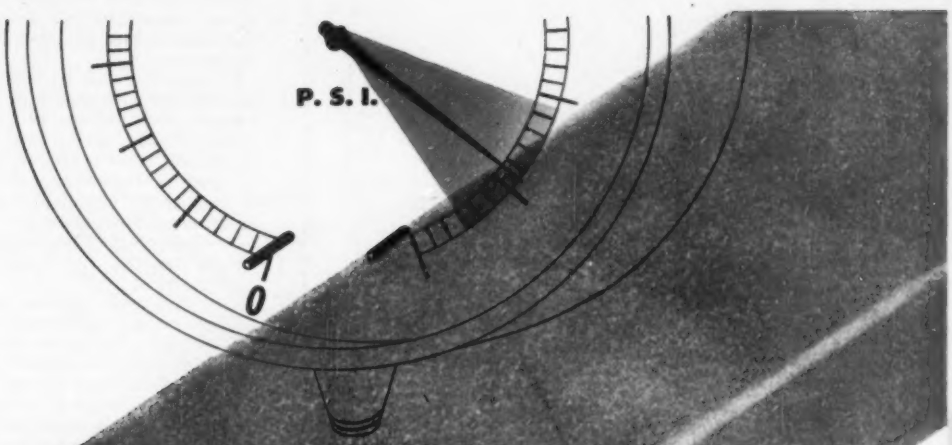
I THINK "postgraduate" courses in foremanship are very useful in any plant and ought to be helpful to any foreman. But such courses should not be restricted to foremanship; they ought to include any technical or engineering subjects that might qualify a foreman to better serve his employer and make him better fit for a higher position.

I have myself been a foreman and have been promoted after several years of study in evening engineering schools. In those days there was no talk of the Old Man being interested in educating his foremen. I think Ed should grasp such an opportunity of having a chance to go to school on company time, without complaining. If I had had an opportunity of this kind, there would have been no end to my ambition.

I used to work as a machinist 8 hours a day, and after dinner I went to school until 10 o'clock at night, and my home work I had to do after that time and on Sundays, or whatever spare time I had. But not only that. In some periods my eyes gave out so I had to take a rest. However, I went through the Franklin Union Engineering School and Lowell Institute in Boston, Mass., and I am still studying whenever I have a moment to spare. I have held positions as general foreman, tool engineer, superintendent, etc., and I am still ambitious for higher responsibilities.

If Ed does not want to go to school on company time, he is not the best kind of a foreman. He must have got his job through some friend or relative of his. If he had been in my place he might perhaps have got nowhere. I lost my job when I was going to an evening school and had to postpone my engineering education, as I had to support myself, but then I went to the U. S. and eventually continued my education there. I wonder if a foreman like Ed realizes what it means to have to learn a brand new language on his spare time before being able to follow the instructions in courses such as those under discussion? I challenge him to consider what a splendid opportunity he has and warn him not to be so stubborn as he seems to be.

The onward march in engineering



Where PRESSURE is a factor...

GUN IRON CASTINGS

IF YOU require pressure castings, it will pay you to investigate Gun Iron. First of all, the dense, close-grained micro-structure of Gun Iron is ideally suited to pressure type, leak-proof castings. Added to this, in our foundry you find all the modern controls, equipment and procedures required to assure uniform, porosity-free castings in any size and with the most intricate coring.

These are but two of the important reasons why Hunt-Spiller Gun Iron has been preferred for pressure, wear-resistant and other types of high quality castings for 139 years. To cite one application where pressure is an important factor, Hunt-Spiller produces many of the cylinder heads for leading manufacturers of diesel engines. Frequently, we also finish machine the heads in our manufacturing department to provide complete quality control from furnace to foundry to finished product.

Our engineers stand ready to help you determine the value of Gun Iron and its alloys for your cast parts. Why not investigate right away?

GUN IRON *in the* METALWORKING INDUSTRY

Hunt-Spiller casts and machines parts for a wide variety of applications in metalworking. A few are shown below:

DIES • MACHINE TOOL CASTINGS • SURFACE PLATES • WEARING PARTS FOR PUMPS, COMPRESSORS, ENGINES, ETC. • H-S THREE PIECE RINGS • PRESSURE CASTINGS

Chances are that there are many other places where Gun Iron can solve a design or operating problem. To help you determine the value of Gun Iron for your cast parts, our metallurgical department has prepared a comprehensive bulletin which contains complete properties and discussions of Gun Iron and many other metals. Engineers claim it an invaluable reference aid. Send for your free copy today.

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"WELL---
WHADDA YA KNOW!"

No--this man hasn't discovered who murdered the butler and stuffed his body in the bath-tub.

He's reading an advertisement in THIS magazine! He has his eye on a product that promises the answer to a brand new problem he's been sweating over.

Exaggerated? Not a bit! For the advertising pages of every McGraw-Hill publication are replete with ideas, products, services designed for the men who are responsible for design, production, maintenance, marketing—every specific operational phase of modern business and industry.

Month after month America's leading manufacturers are parading their newest and best wares before your eyes in THIS McGraw-Hill magazine. You're the judge and jury as to whether they can *solve a problem—offer a short-cut—show a profit*—for you.

To keep in touch with the parade------

READ THE ADS.

that any foreman should observe, makes it necessary to arrange courses so that the leading men at least, in any shop, are kept up to date in their own fields.

Is it possible that Ed is unaware of the benefits that might be gained through such courses as training within industry, quality control, cost factors, etc.? And is Ed able to handle labor in the new ways discussed to keep up the efficiency of his department? If he is not aware of these facts he should be given some castor oil and then told to go to school on his own time.

But jokes aside, there is nothing gained by trying to force anybody to go to school, this must be optional. I also think any "postgraduate" course arranged to increase the foreman's ability to better serve in his capacity or to give him an opportunity for promotion more than pay for themselves.

A. E. Fristedt
Stockholm, Sweden

•

BACK ON THE CLOCK

BEFORE management requires supervisors to punch time clocks it should carefully consider whether this action will lead to loss of some of the support and enthusiasm of the supervisors. Putting foremen back on the clock will serve no useful purpose but only emphasize unnecessary restriction of the individual. Restrictions of this nature are not indicative of a morale-building organization. The maintenance of the morale of the foremen is just as important as keeping up the morale of the rank-and-file employes. Morale of the supervisory staff can be maintained only through the honesty, fairness, and cooperation of management.

Of course, the foremen should play fair with management. Taking undue advantage of the privilege of not having to punch in or out shows a lack of proper consideration for management. It also does not set a good example for the rest of the workers when the foreman attempts through subterfuge to evade his responsibility for proper attendance.

Foremen represent management to the workers; they must have the authority to do so properly. When the foremen are stripped of some of their privileges and authority they cannot properly represent management to the workers. When someone in the higher echelons arbitrarily sets the policy of requiring supervisors to punch time clocks, he is violating one of the principles of good man-

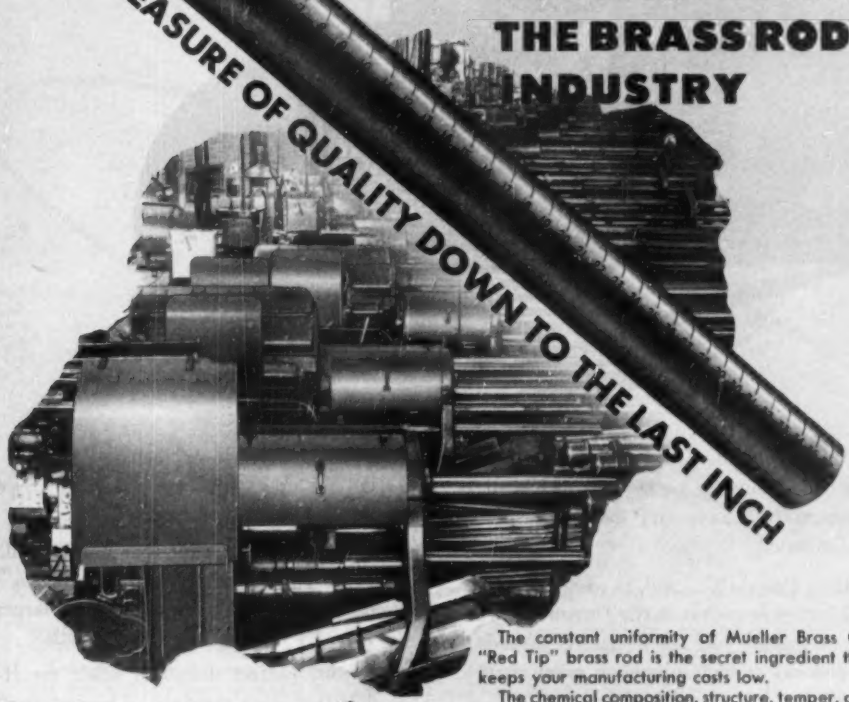
(Continued on p. 177)

MUELLER BRASS CO.

Brass Rod

THE YARDSTICK OF THE BRASS ROD INDUSTRY

FULL MEASURE OF QUALITY DOWN TO THE LAST INCH



The constant uniformity of Mueller Brass Co. "Red Tip" brass rod is the secret ingredient that keeps your manufacturing costs low.

The chemical composition, structure, temper, and mechanical properties, are so closely controlled that no perceptible variation in machinability can be detected from one lot to another. A true, all-purpose, free cutting rod for knurling, deep drilling, thread rolling and bending, the perfect answer to more efficient production.

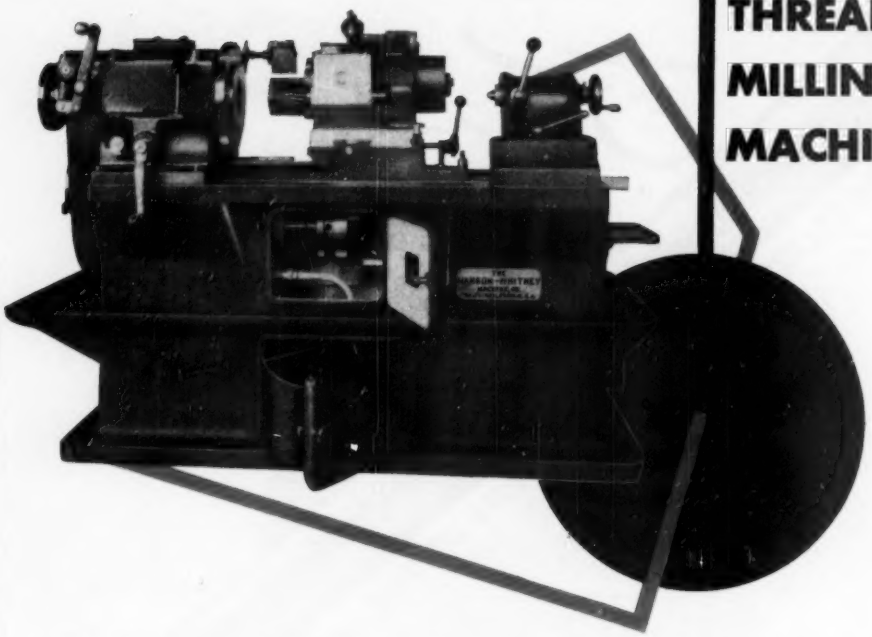
Order a supply of Mueller Brass Co. "Red Tip" rod today—shipment can be made at once from our large factory stocks.

MUELLER BRASS CO.
PORT HURON, MICHIGAN

MUELLER BRASS CO. Streamline PRODUCTS

PERFECT THREADS external or internal

NO SPOILAGE with Hanson-Whitney THREAD MILLING MACHINE



Today's requirements for low cost, perfect threading of so many, so varied and such costly metal parts make it necessary that work spoilage be eliminated.

The "Milling Process"... and, in particular, the Hanson-Whitney Semi-Automatic Thread Milling Machine . . . gives you 100% perfect threads. And it produces at high speeds on many materials, otherwise difficult to machine.

Because of the Multiple Cutter principle used, threads of varied lengths are completed in one revolution of the work. Threading may be right or left hand, external or internal, straight or tapered. All operations are automatic except insertion and removal of work.

Three machine sizes permit External Threading from ¼" to 10" dia.; Internal Threading ¾" to 10" dia. The size pictured above (the largest) has a capacity of 10" dia. x 24" length.

For low-cost, perfect threading select the H-W Thread Miller . . . a standard of highest quality throughout the industrial world.

SPECIAL BULLETINS ON REQUEST

HANSON-WHITNEY COMPANY, HARTFORD 2, CONN. • Division of The Whitney Chain Company

Hanson Whitney

PIONEERS OF FINISHED TAPS

Gear Tooth Crowning

(ELLIPTOID TOOTH FORM)

A CONTROLLED PRECISION MACHINING OPERATION

Gear tooth crowning (Elliptoid Tooth Form) is used for just one purpose—to prevent "end bearing," which is a concentration of operating load at the end of the tooth where it is most vulnerable to failure.

Crowning is the only way to prevent end bearing because with any gear assembly it is impossible to maintain accurate gear alignment under all conditions of loading. Shafts, bearings and mountings are all elastic. Even the slightest deflection will cause misalignment and end bearing in gears with conventional teeth.

Many of the leading automotive gear plants have standardized on crowning to raise the factor of safety of gear teeth and to reduce operating gear noise. Crowning does both successfully.

Crowning accomplished on Red Ring Gear Shaving Machines is a precision machining operation by which the maximum amount of crown is always under positive control. Tolerance control is indicated by a typical routine check of a lot of 4000 gears having the following specifications: 1″ face, 18 teeth, 13.5 Nor D.P., 20° Nor P.A., 27° H.A. and .0003″ to .0005″ crown. An adequate check failed to reveal any unit outside the .0002″ tolerance on crowning.

WRITE FOR BULLETIN S49-5 FOR A MORE DETAILED DISCUSSION OF GEAR TOOTH CROWNING

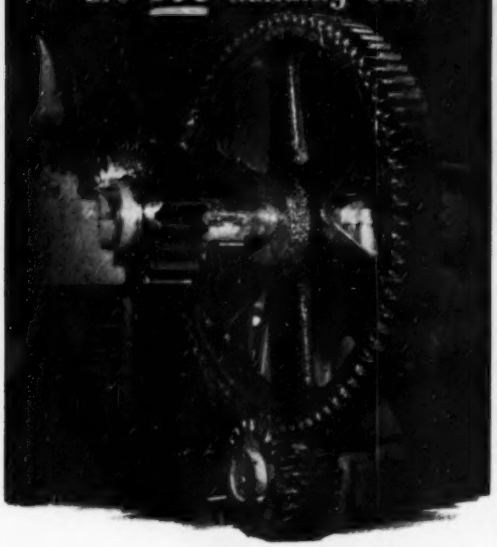
5621

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

What kind of PUNISHMENT are YOU handing out?



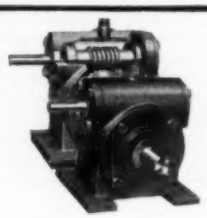
Dust? . . . dirt? . . . vibration? . . . sudden load changes? . . . 24-hour operation?

It takes a *good* gear to stand up under the tough punishment found in industry today. And Grant — thanks to over 70 years of experience — makes *only* good gears. So when you're faced with a really tough gear problem — call on Grant for a fast, economical solution.

Grant Gears are made in standard and custom types from ¼" to 72" in diameter. Hundreds carried in stock at all times. Send prints or specifications for quick quotation.

Look to Grant for *gear units*, too . . .

. . . hundreds of types and sizes available from stock — write for bulletin



Grant GEAR WORKS INC.

169 W. Second St.
South Boston,
Mass.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

DOUBLE-END END MILLS

offer definite superiorities

- LESS BREAKAGE
- UNIFORM HARDNESS
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agement. Sound management requires that such a procedure be explained to the foremen on this topic. A company policy of this nature should get to the foremen direct without depending on the grapevine with its usual distortion and falsification.

It seems to me that if certain foremen were to blame for abusing the privilege of not having to punch time clocks, management should have given its viewpoints direct to the errant foremen. This statement should have been neither a diatribe nor a short course in personal management. The foremen should have been tactfully warned and explanation made of company policy with regard to violation of the privilege supervisors had of being free from the restriction of time clock punching.

The foreman who is guilty of reprehensible collaboration in getting one of his own workers to illegally punch his card can only blame himself for losing his stature as a leader in the worker's eyes. How can he expect respect from the men when he demonstrates by his very dishonest acts his lack of respect for management? It becomes a vicious cycle when the foreman demands such favors from his men. They expect favors in return, and a bad situation is the result. When privileges are abused in this manner, management will naturally seek to eliminate the cause of this abuse and restrict the privileges. It is hardly fair to the rest of the executives to have them punch clocks because of the defection of a few misguided individuals in the matter of attendance.

Putting the supervisors back on

I don't know about that new guy—he keeps saying, "My, what won't they think of next!"

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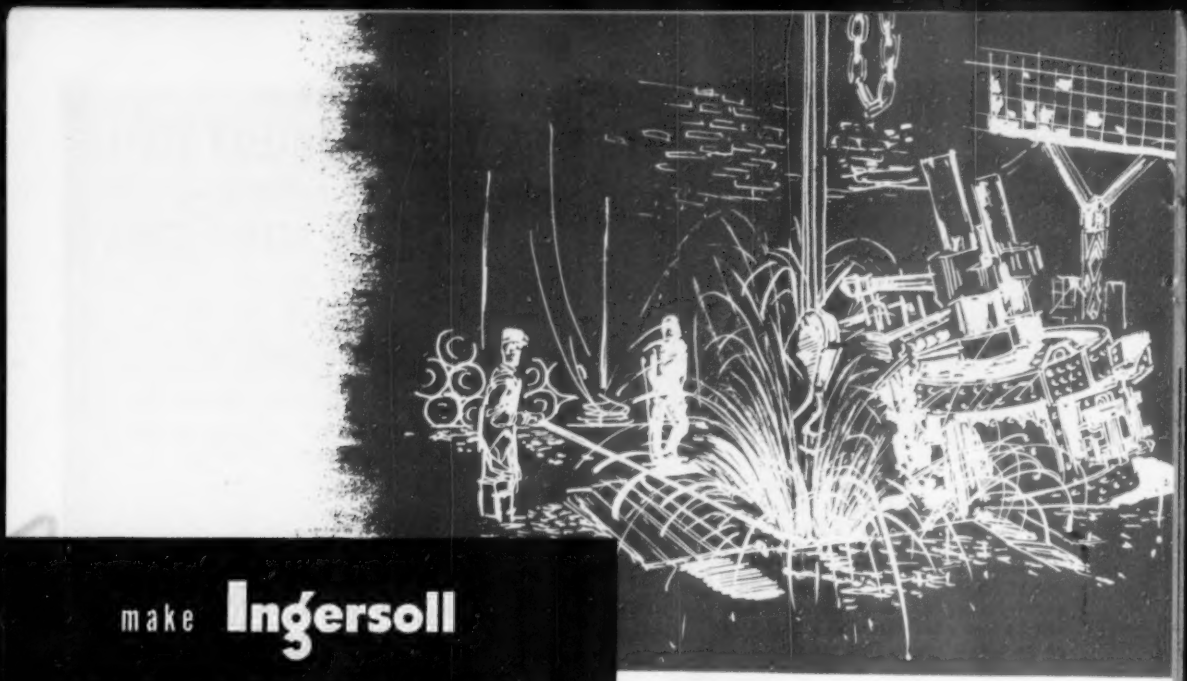

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ENGINEERING BW PRODUCTION

the clock will hardly make them feel that they are part of management. Good administration demands that there be an established policy and adequate regulations covering supervision of the supervisors. Why couldn't the threatened action of putting the foremen back on the clock have first been taken up at the weekly meetings of the supervisors? Most good organizations have weekly meetings of foremen and supervisors, with records of decisions for reference. Such conferences would permit correction of abuse of proper attendance of foremen in the shop. The conference would also serve as the effective sounding board for the merits or disadvantages of the proposed introduction of time clocks for foremen. It would serve notice on the man who is not carrying his weight as a foreman, and tend to integrate his activities with that of management. Divided allegiance to management means weakness as a supervisor.

Harry Kaufman
Philadelphia

•

MANY A HOT SESSION has been held over this subject. Companies have tried it with varying success. The punching of the clock has always been a symbol in our free enterprise system of an hourly worker. Not that hourly workers are not as brilliant as salaried employees . . . but due to the nature of working by the hour some accounting system was needed. The time clock was used to fill this need. Salaried employees on the other hand, work by the week or by the month. This method does not require the careful accounting since the type of work these men do is more erratic than that of the hourly employee. Much more thinking enters into the salaried employee's work. He cannot stop and start his thoughts as the whistle blows. Frequently the shop problems go home with this employee and many hours away from the office are given to the job. So under the old free enterprise system these men were given a little freedom and were not required to punch the clock.

Why then a trend backwards? This probably has happened for two reasons. First, not all salaried jobs require the same amount of thought or intangible work. Many employees began taking advantage of conditions. Instead of being in on time they came in fifteen minutes to an hour late. True, in some cases the employee might have worked late and long on a problem the night before, but too often he was "out with the boys." Companies have never

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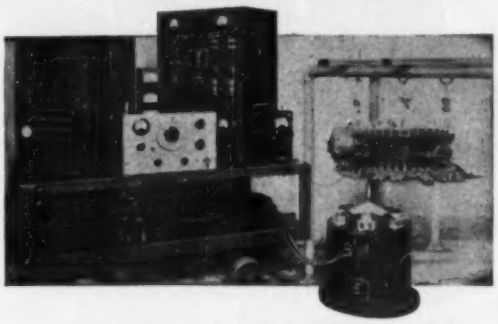

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scolded those who had a good reason, but when flagrant misuse of the permission granted with salary became a problem some companies went to the extreme of placing certain salaried groups on the clock as an example to all others.

Yes, hard feelings resulted and are long lasting. An employee who is not guilty feels a resentment against the company. It often causes troubles than can never be mended. Then to the aid of these industrial companies came the government regulations which saw that no employer overworked his help without pay. First, this pertained only to hourly workers, but as the years have rolled on and more and more controls have been placed on business, certain salaried groups are now required to punch the clock. So many companies got a break in their program to have employees placed on the clock.

Is it successful? In a country where we like freedom, how can controls be successful? Oh, they are enforceable and most employees go along because one or two people cannot buck the law. Are we actually accomplishing anything? No. Many a time have I heard the cry of engineers who spend years obtaining a degree . . . only to find that they are just clock punchers. How do they feel? Not very happy. Whom do they blame? The Government? Oh no . . . the company—for to an employe all regulations stem from the company. So we see that our new crop of technical men are beginning to feel the pinch of control and don't like it, but probably will only take it out on the company because they forget that maybe their company is not a puppet in the hands of government controls.

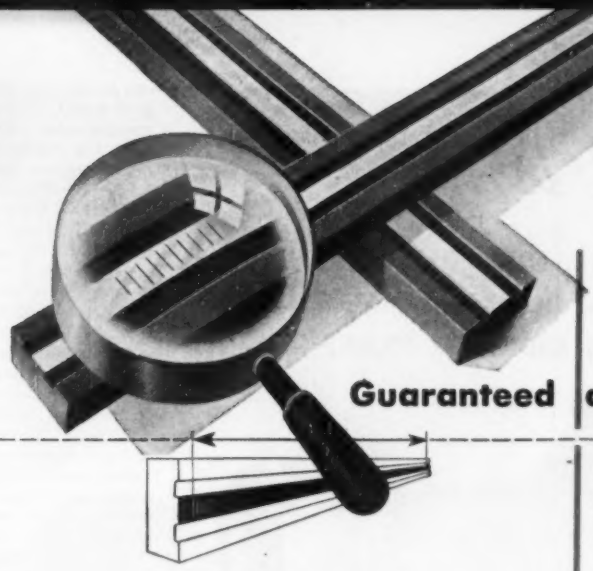
They will awake too late for the ill-feeling toward the company will soon slow down the efforts of the company to produce economically. Let us not lose our freedom by going backwards. Let us try to hold what we have. Certainly placing men on the clock once more is stepping off into deep water. If you are forced to do so, due to governmental regulations, then educate your workers to understand this problem. Let them know the facts . . . why should companies take all the blame for the unsavory controls?

Charles D. Townsend
Fort Wayne, Ind.

•

IF I OWNED a plant, I would insist that everybody in that plant, foremen, manager, treasurer, chief accountant, and all the workers—bar none—would punch a time card. On top of that, I would delegate some-

SIP



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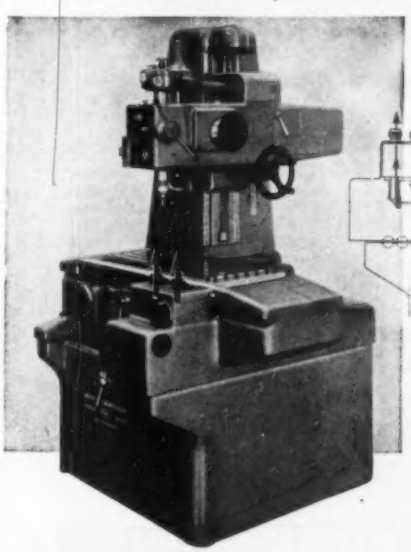
incorporated in all SIP Jig Boring and Milling Machines and Measuring Machines are graduated with the same technique as the fundamental length prototypes for the Bureaux of Standards the world over. Latest developments in calibration permit SIP to detect discrepancies as small as a few micro-inches. The optical system for setting rectangular coordinate dimensions on the work-table of the No. 2H Jig Borer comprises two standard scales at right angles incorporated in the cross-slides and viewed by built-in micrometer microscopes reading to .0001 in. Totally enclosed and free from mechanical strain, it precludes any possibility of wear and ensures absolute permanence of the measuring accuracy.



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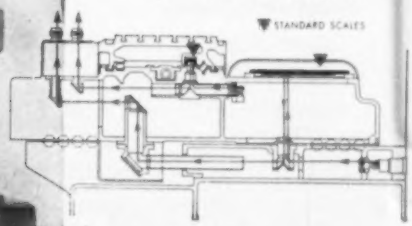

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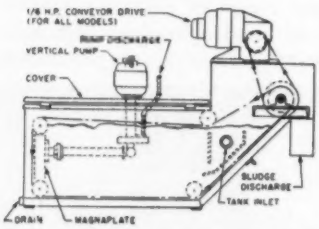

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one to lay a tardiness report on my desk every morning—a report that covered every soul in the organization. The regular late-comers would hear from me just once; after that, I'd issue graduating certificates.

Even so, I know that I would never be smart enough to gather around me a fair-sized organization of salaried personnel who would be consistently punctual. I've never seen this accomplished anywhere, and I don't believe it can be done.

Ninety-eight per cent of all men will take advantage of a supervisory position that carries a salary to favor themselves. Some executives will work after quitting time, but they will not come to work on time. The excuse may be that they worked late at home the night before, they were entertaining a customer, their wife was sick, their children had measles —the excuses are legion, but—they are excuses.

When executives are compelled to punch a time clock, they resent it bitterly, but the minute they are relieved from that chore, then tardiness starts, and early quitting becomes a habit. Only an exceptional man—just one man in a hundred—can be trusted to play the game, when he isn't watched. That doesn't say much for us, but it is the truth.

Some years ago, I was Production Manager of a plant; our general manager was a real stickler for punctuality and attendance, and he was willing to pay to have his hopes realized. Every person in the office, women and men, executives and clerks—all had to ring cards four times a day: In—in the morning; Out—for lunch, and whether you left the office or not, you had to ring; In —at the end of the lunch period; Out—at night.

We were paid monthly. Every employee who made those four punches, without missing, or being tardy on a single punch for a month was paid a 10% bonus. That meant 10% of each individual's monthly pay—whatever it was.

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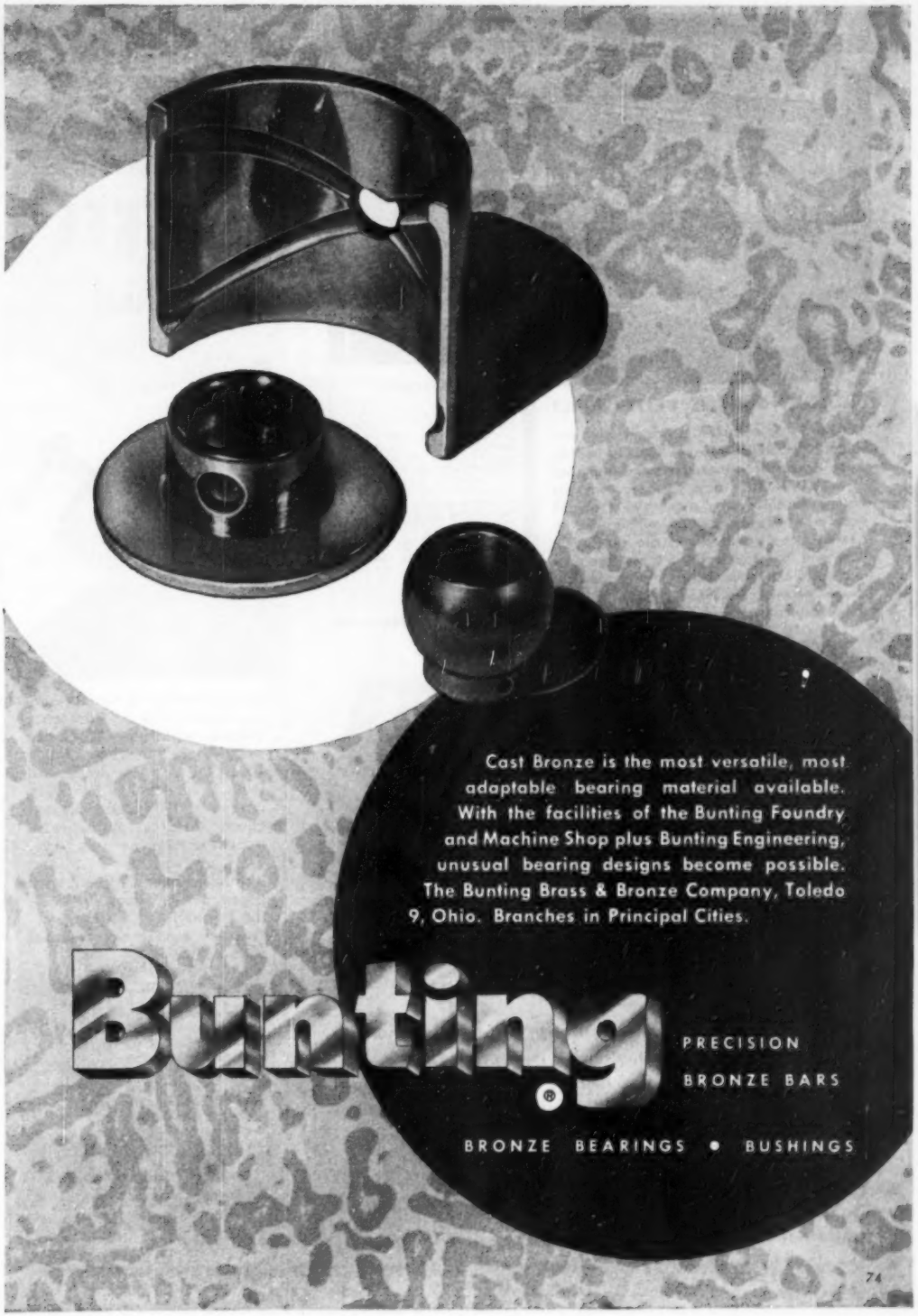
After four misses, the bonus had disappeared.

That 10% bonus was worth working for, but very few people consistently collected a full bonus. In my case, I was working late every

(Continued on page 188)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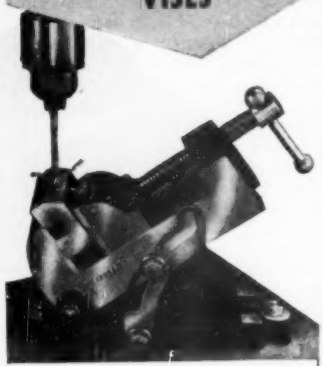

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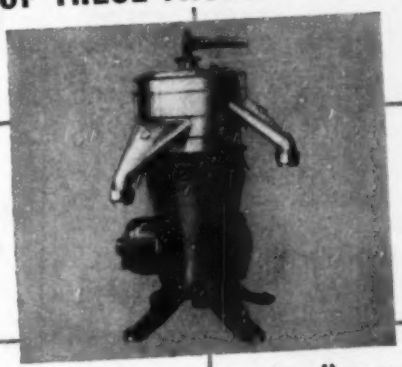

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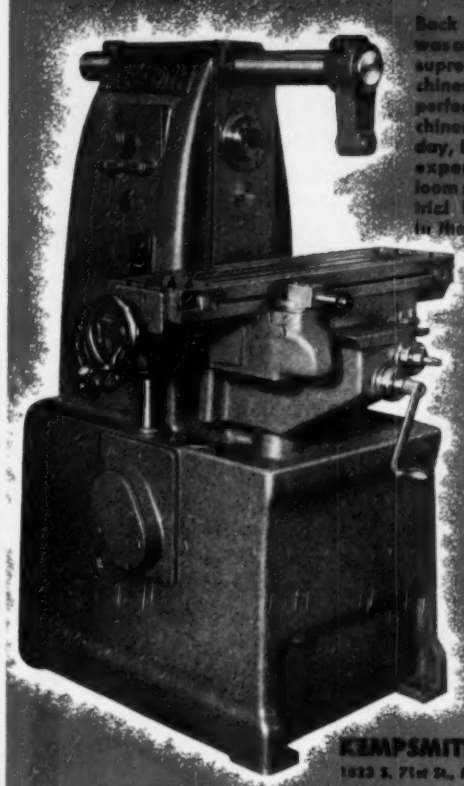

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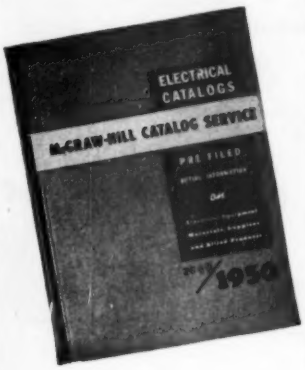

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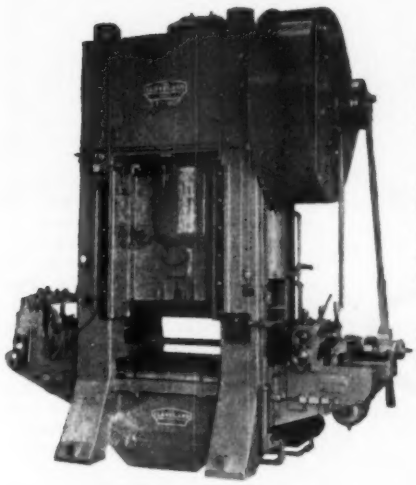


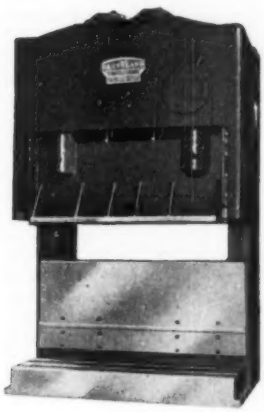
EVERY manufacturer of sheet metal products interested in stepping up production and reducing manufacturing costs will find it advantageous, as many other leading manufacturers have, to install Modern Cleveland Presses designed for speed, accuracy and economy of operation.

The many improvements included in the advanced engineering of Cleveland Presses have not been confined to any one type or size of Cleveland. Every new Cleveland offers *longer die life, increased accuracy* and *minimum maintenance.* The valuable knowledge gained in over 60 years, as builders of precision metal working tools, has enabled us to include vital improvements in each of the eleven types of Cleveland Presses.

Therefore, if you are considering replacing any of your present Press equipment, or installing additional Presses, it will pay you to get the complete specifications covering suitable Cleveland Presses. A-0413

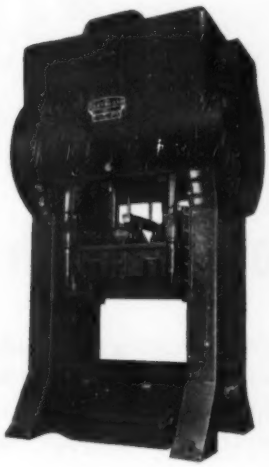
SINGLE POINT STRAIGHT SIDED PRESS EQUIPPED WITH DOUBLE RACK AND PINION ROLL FEED

Stroke	3"
Adjustment	6"
Shut Height	28"
Face of Slide	34" x 40"
Area of Bed	42" x 48"
RPM	45"
Capacity	600 tons



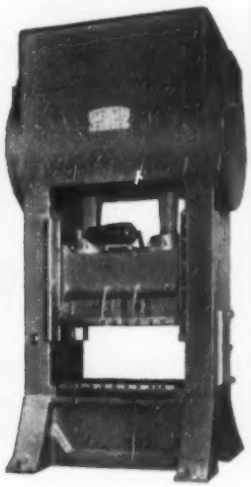
TWO POINT OPEN BACK GAP PRESS

Stroke	12"
Adjustment	8"
Shut Height	54"
Face of Slide	30" x 84"
Area of Bed	32" x 100"
RPM	30
Capacity	125 tons



TWO POINT DOUBLE ACTION TOGGLE PRESS

	SLIDE	BLANKHOLDER
Stroke	23"	15"
Adjustment	5"	5"
Shut Height	37"	35"
Face of Slide	34" x 56"	45" x 66"
Area of Bed	45" x 72"	
Capacity	200 tons	120 tons



TWO POINT STRAIGHT SIDED PRESS

Stroke	12"
Adjustment	8"
Shut Height	36"
Face of Slide	48" x 60"
Area of Bed	48" x 60"
RPM	30
Capacity	300 tons

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night, developing a planning system; when I left at midnight, I forgot to punch out quite often. Even though I could prove I was working, that didn't help: I had failed to meet the conditions laid down by our chief. The large majority of misses were charged to people who were a few minutes late in the morning—the usual A.M. heavy-sleeping brigade.

Oh yes, I used to believe the cries of righteous indignation from executives of all grades who were required to punch time clocks. They didn't mind . . . it was the principle of the thing—etc.

The correct answer is—NO SOAP. It ain't so. They were spoiled in the sweet bye and bye by doting mothers.

Here, in Detroit, the so-called engineering job-shops do the best job of getting all talent to work on time that I have ever seen anywhere. Their system is universal, simple, but effective. Nobody gets a salary, so nobody can coast. Sales-manager, Chief-engineer, squad bosses, designers—everybody—is on an hourly rate of pay. No work—no pay. Penalties start with the first minute a man is tardy.

A man may not be fired if he is late a few times a week, but he certainly isn't going to be paid for his alibi. The sales-manager can entertain a customer, and if he is two hours late, he may be able to claim he earned a gem for his diadem—whatever that is, but the boss isn't paying for his college try.

I'll agree that punching a time clock seriously interferes with an executive's successful manipulation of his salaried privileges—the ones he hopefully wants—but, if I owned the business, that's the way it would be.

James K. Matter
Detroit

•

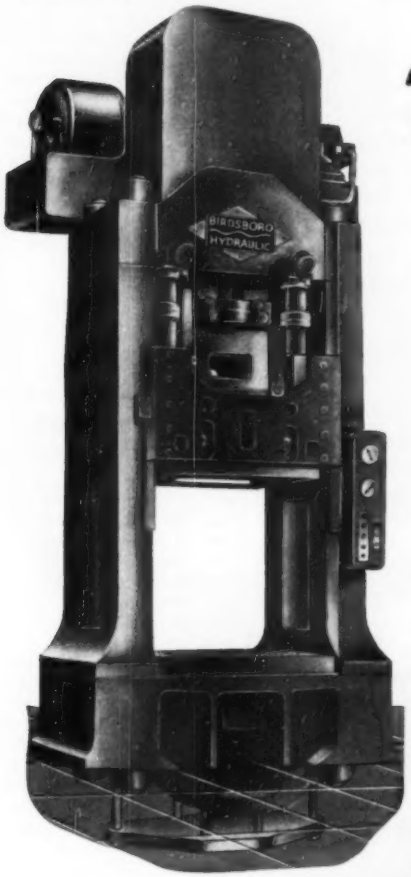
WHOSE BUSINESS?

IT IS NOT a question of whose business it is if the boss gets an order for one dollar or a million—the man in the shop is not interested in the dollar value of the order—he is interested in the backlog of hours which he can work, and he needn't be told that there is a "lot of work coming up"—he usually can judge that for himself from the activity in various departments—especially the receiving department—more especially if he notices a steady flow of raw materials coming into the shop.

Nothing depresses the worker—or decreases production efficiency—so much as "scraping the bottom of the barrel" for jobs to keep him busy. I believe that the average worker is

Preliminary draw on Birdsboro Press forms rectangle 7" x 10" recessed to 6"

Final draw on same press deepens the well section to 9½"



"A Better Product At Less Cost"

is what this manufacturer tells us about the operation of Birdsboro Hydraulic Presses in deep-drawing cooking wells to a depth of 9½". The unusual method which is illustrated here saves considerable time and money over the former procedure of making them in two parts, joining them and finally the necessary finishing.

This Birdsboro Hydraulic Press is triple action, 350 ton capacity. It is an outstanding example of Birdsboro's advanced engineering techniques and ability to design and construct presses with wide flexibility of cycle selections, speed and pressure controls to meet specific and often unusual production problems. Feel free to call on Birdsboro's engineers at any time for a discussion of your particular press problem.

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Just as every army needs its machine guns and bazookas to complement its heavy equipment, every shop needs one or more of these light, fast, easy to operate precision lathes. There are many jobs that can be done faster, at lower cost, and with less experienced operators, on Sheldon Lathes, than on more cumbersome, more costly machine tools.

With extra collet capacity for size, "Zero Precision" Tapered Roller Bearings, more power at the spindle than other "small" lathes, and rigidity based on scientific placement of metal rather than cumbersome mass, these moderate priced lathes are money makers. Just as "bazooka" has the hitting power of much heavier and costly armament, the modern little lathes have the earning power of much big equipment.

They are modern tools you should be familiar with, for they cut cost and increase profits in many ways.

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fair in that he wants to do his share of the work, if work there be—so keep work scheduled ahead and let the man see that jobs are piling up and he'll not even question the dollar value of the backlog. He takes it for granted that the boss will get a fair price for his goods. Otherwise, "how does he stay in business?" On the other hand, telling the man in the shop that you are losing money on the order will set up the same feeling of insecurity as the lack of work or orders.

As to the average worker snatching for the last nickel—he usually does so only when goaded by someone who has idle hands and plenty of time to do nothing except gripe.

A knowledge of the dollar value of an order could be used as a talking point by anyone trying to influence or goad the men into snatching for the very last nickel. Because the sales price does not give a true picture of actual costs and profits, some men may be influenced by a distortion of the facts and may be inclined to believe that the sales price is the amount of money which the boss puts into his pocket. If it is necessary to reveal the amount of orders in a backlog why not state the amount in manhours rather than in dollars and cents?

Henry George
Dayton, Ohio

NEW BOOKS

PATENT TACTICS AND LAW *(3rd Edition)—By Roger Sherman Hoar, M.A., LL.B., commercial attorney—Bucyrus-Erie Co. Published by The Ronald Press Company, 15 E. 26th St., New York 10, N. Y. 352 pages, Price $7.*

To many engineers, inventors, and business executives, patent law is a maze deliberately designed to entrap the unsuspecting. And they soon discover that a little knowledge, based on hearsay, is worse than none at all. As the author quotes Josh Billings, "What we don't know don't hurt us, so much as knowing sech a lot of things that ain't so."

Mr. Hoar, while handling the legal affairs of Bucyrus Company (forerunner of Bucyrus-Erie) found that executives and engineers had difficulty in understanding explanations of the frequently confusing principles of patent law. When an explanation of any particular point

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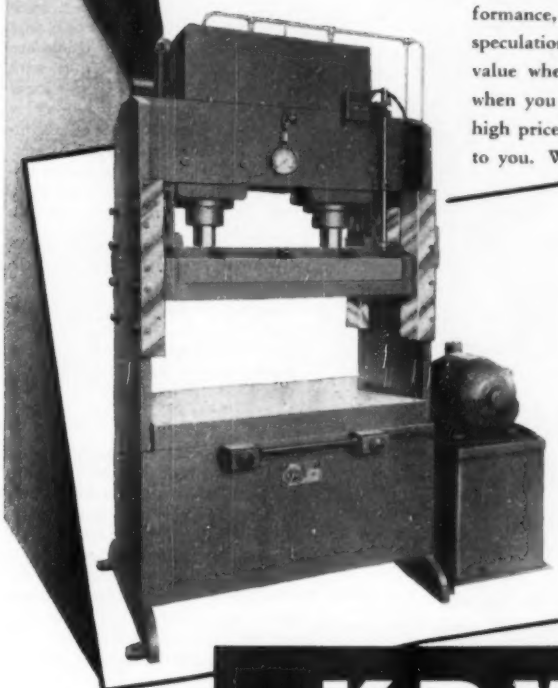

Quick View of Plus Values

Heavy steel plate construction. Precision honed cylinders. Adjustable tonnage pressure control. Adjustable limit switch for top return position of ram. Safety by-pass prevents overloading beyond maximum rated capacity. Large self-contained oil reservoir. Direct connected motor drive to pumps through easily serviced flexible couplings.

Safety controls prevent accidents. Long bronze faced gibs adjustable for wear insure accurate travel of slide. Presses can be custom built to meet your manufacturing requirements. Quiet and vibrationless in operation.

Two Cylinder Type—*illustrated*

Tons capacity 60 85 100. Platen and bolster, maximum usable size, F to B, R to L, 36" x 60". Stroke 6" 11". Bed, fixed.

Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.

K·R·WILSON

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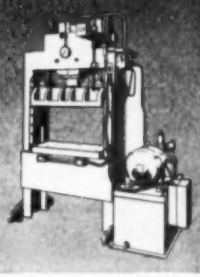
One Cylinder Type

Tons capacity 25 50 75 100 125 150. Platen and bolster, maximum usable size 24" F to B, 36" R to L. Stroke 6" 11" 18". Bed adjustment — increments of 6".

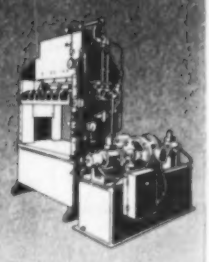
Controls: Manual, Semi-Automatic, Fully Automatic, for cycled operation.

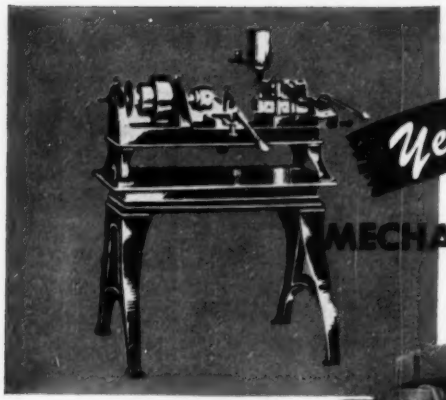


Three Cylinder Type

Tons capacity 75 100 125 150. Platen and bolster maximum usable size, F to B, R to L, 48" x 72". Stroke 6" 11". Bed, fixed.

Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.



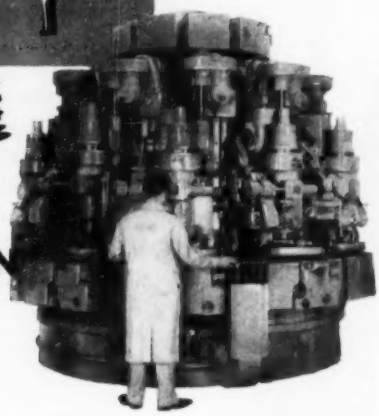


Yesterday

MECHANIZATION

Today

AUTOMATION



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"clicked," he jotted down, as nearly as possible, the exact words used successfully. These notes provide the basis for his book; to them he has added footnote citations of illustrative cases as support for the statements of law appearing in the text. The result is a most worthwhile contribution to any business library.

The book wasn't born, it grew, and it is still growing! However, this Third Edition contains new material of special importance. In addition to a complete revision of the earlier material in the light of modern practice, it also contains the "*Rules of Practice*" of the Patent Office effective as of March 1, 1949, which were completely revised, rewritten, and renumbered. Also, this edition has been brought into conformity with the newly written "*Manual of Patent Examining Procedure.*"

Not "Be Your Own Lawyer or How to Take Out a Patent," this is, rather, a helpful guide to better understanding of legal tactics between business executive, engineer, and patent attorney.

•

FRICTIONAL PHENOMENA—*By Andrew Gemant, Ph.D., M.D., Staff Physicist, Research Dept., The Detroit Edison Company. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 497 pages, Price $12.*

Friction is one of the oldest mysteries puzzling the minds of scientific thinkers, yet it is only in very recent years that any measurable, quantitative rules have come forward to utilize or overcome its various effects. Still it is a series of phenomena—not definable or measurable by a single, over-all, and accepted law. To understand frictional behavior at all, one must see it in every medium, under a variety of conditions, and with a knowledge of all of the guiding facts available.

That is exactly what this book offers. Andrew Gemant has taken a series of 16 chapters on the subject published in the *Journal of Applied Physics;* to these he added six new chapters, then reedited and brought up to date the entire collection. In five parts, it discusses frictional processes in general, then in gases, in liquids, and in solids; ending with a valuable section covering problems —with their solutions, plus an extensive index.

This is a working book which can save many hours of valuable time for the person doing research or development involving friction. And what process doesn't?

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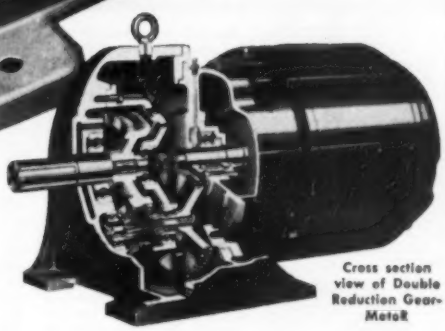

Cross section view of Double Reduction GearMotoR

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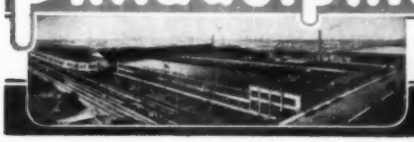

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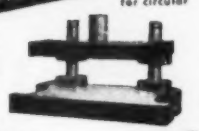

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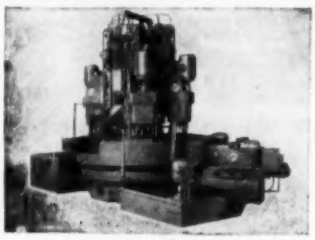
When you need high production with low unit and maintenance costs, consider the advantages of Roto-Matics. In this case the Roto-Matic is a station-type machine with indexing table. Drilling and reaming both suspension and king pin holes in front suspension support arms are performed at the rate of 83 pairs or 166 pieces per hour



General view of drilling and reaming machine equipped with new Roto-Matic mechanical power heads.

An outstanding new Davis and Thompson development incorporated in the design of this machine are the Roto-Matic mechanical, electrical power heads operated by screw feeds. Included among the safety features are overload release clutches on the feed screws. Six heads are used, three vertical and three horizontal. Lower maintenance costs are obtained through elimination of excessive servicing.

Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. Investigate the profitable applications of Roto-Matics.

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From the *American Machinist* Library of *Tips for Top Shop Men*

ARE you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

DON'T put a worried man on a critical job. If safety is a function of flawless timing, the man with something else on his mind is accident prone. Give him a safe job for a while, until his sorrow, illness, financial ailments, or mental scramble can straighten itself out.

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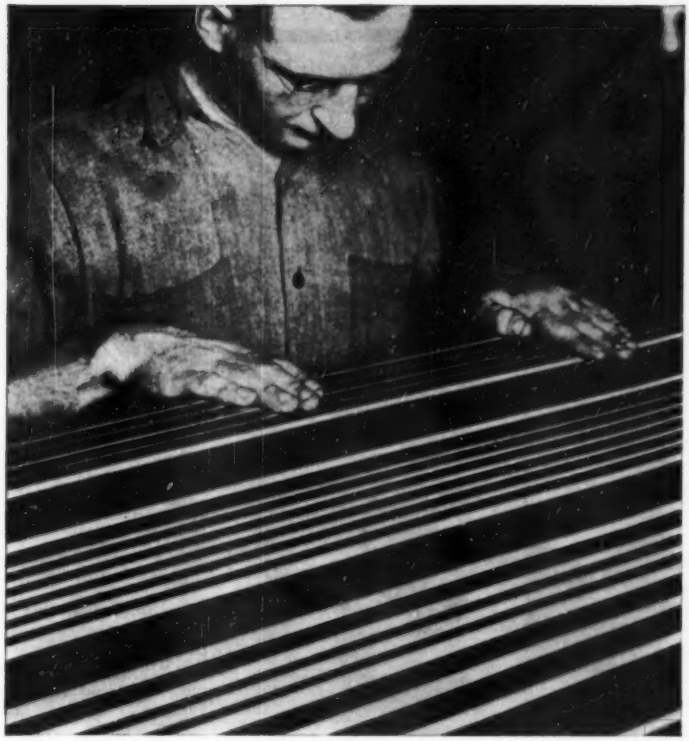

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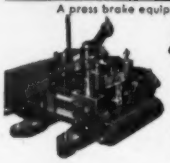

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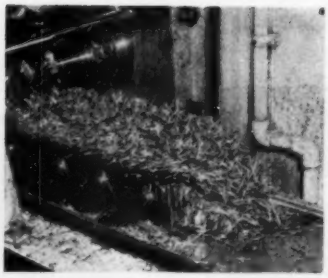

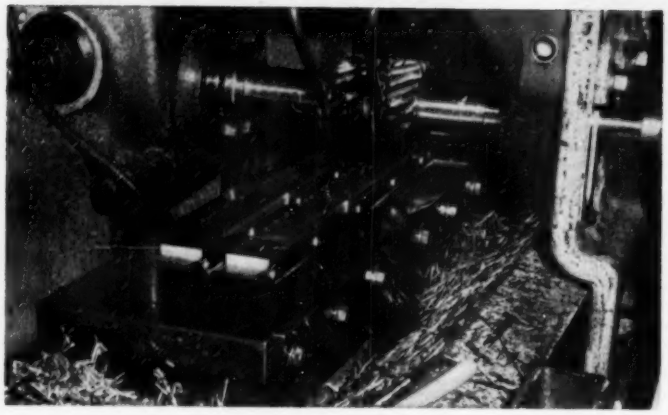

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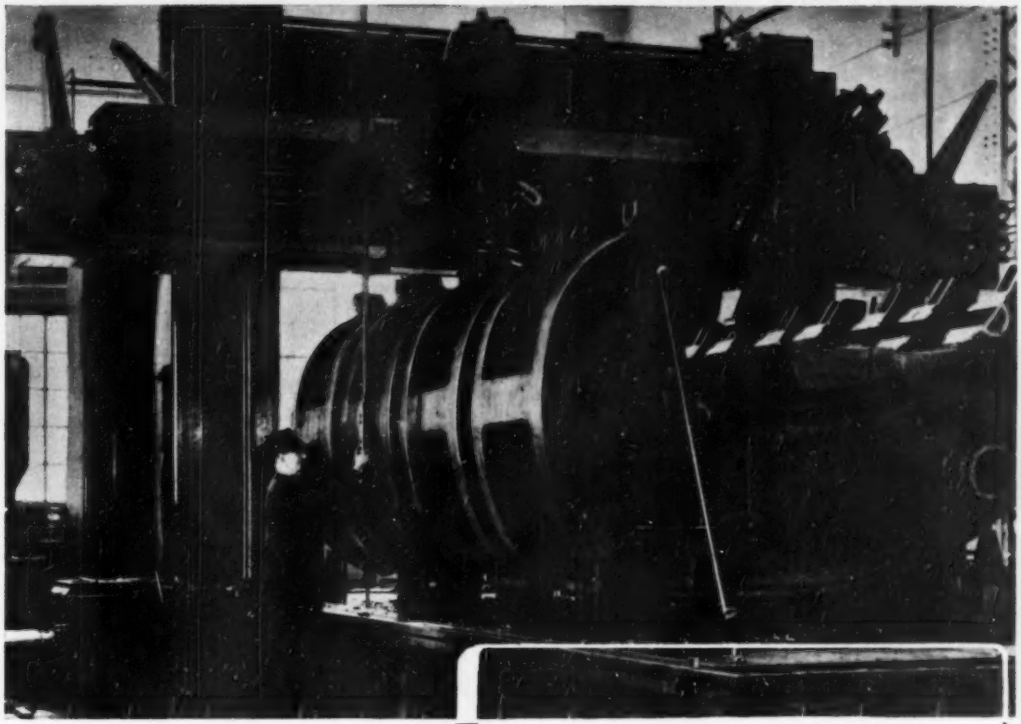

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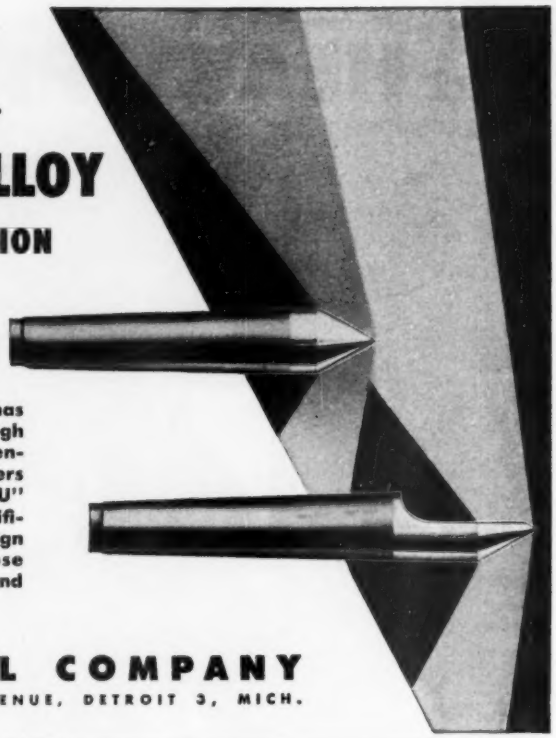

So superior is this alloy that by *actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard "M-40-U" alloy tipped centers can be furnished from stock. Special "M-40-U" alloy centers can be furnished to your specifications, or our engineers will help you design special centers to fit your needs. Choose GORHAM "M-40-U" for top performance and long wear.

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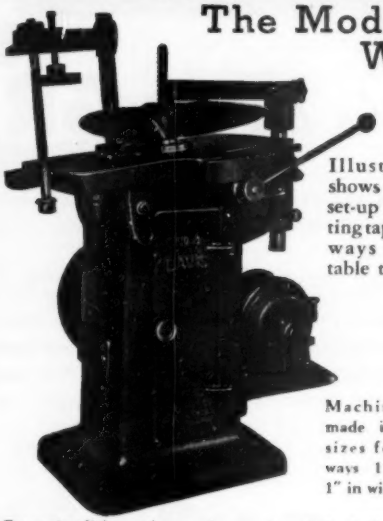

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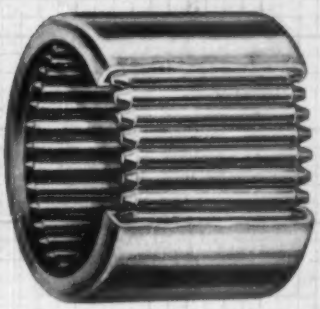

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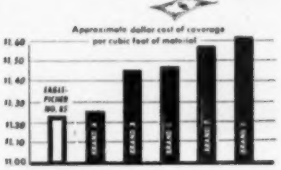
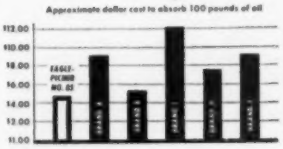


Comparative Absorption Costs



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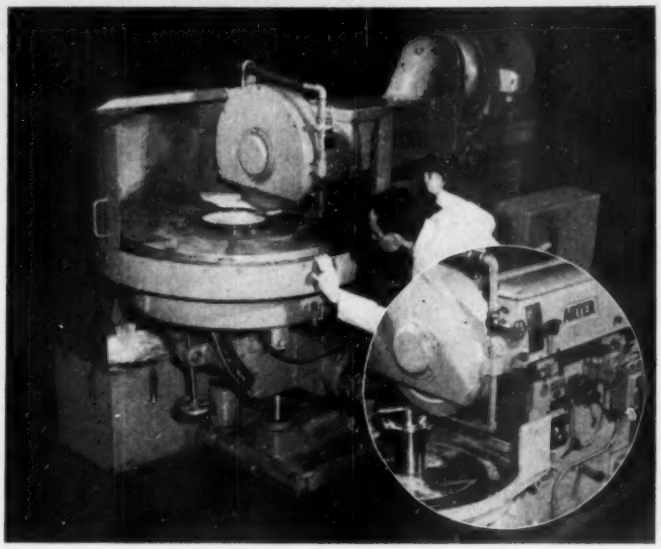

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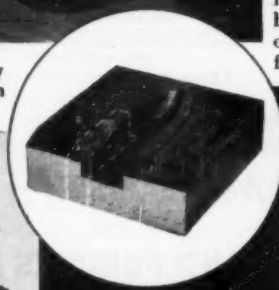

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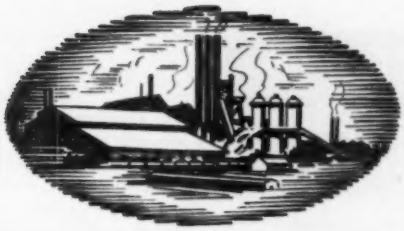

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- Since 1900 we have more than doubled the output each of us produces for every hour we work.
- Since 1900 we have increased our annual income from less than $2400 per household to about $4000 (in dollars of the same purchasing power), yet . . .
- Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

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An ounce of prevention

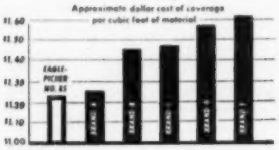
EAGLE-PICHER INDUSTRIAL FLOOR DRY NO. 85

is worth a pound of cure

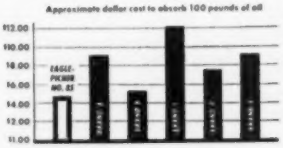
Eagle-Picher Industrial Floor Dry No. 85 is a granular mineral compound—chemically inert, non-combustible, and insoluble in oil, grease, kerosene or water. It can give you positive reduction in operating costs plus greater safety. Write for complete information.

Here's proof that Eagle-Picher Floor Dry No. 85 is tops in efficiency, economy

Comparative Coverage Costs



Comparative Absorption Costs



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The Eagle-Picher Company

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The Eagle-Picher Company
Department **AM-10-50**
Cincinnati (1), Ohio
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EAGLE EP PICHER

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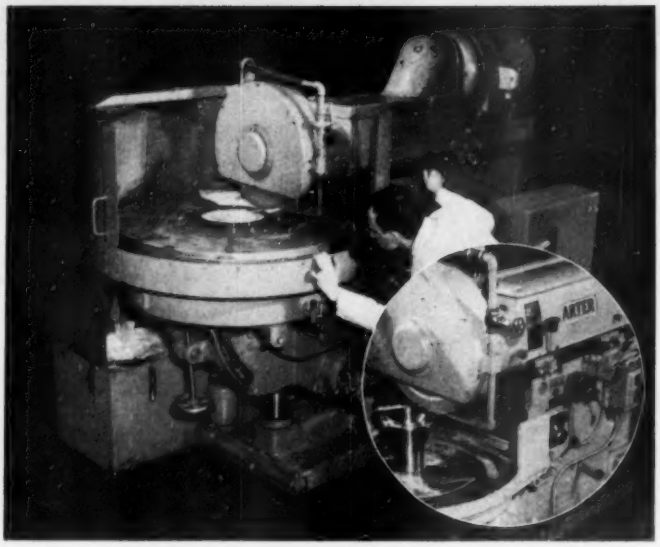


Grinding Parts For Jet Engine on ARTER Rotary Surface Grinders

Shown here are two Arters at the well-known AVRO CANADA PLANT. Extreme accuracy, finest finish, uniform precision are musts for their work. . . . Many jobs, such as shown, require both surface grinding and diameter grinding at the same chucking. . . . Easy with an Arter as a finefeed arrangement can be supplied to accurately move the wheelhead by hand as well as hydraulically. Grinding is done with the side of the wheel.

The other job (insert) utilizes the great vertical capacity of the standard machine.

These features, as well as tiltable work table, make an Arter adaptable to a wide range of work.

ARTER
GRINDING MACHINE CO.
WORCESTER, MASSACHUSETTS • U. S. A.

From the *American Machinist* Library of *Tips for Top Shop Men*

IF your plant is still departmentalized, study the advantages of straight-line rearrangement. Handling is usually too expensive nowadays to justify the luxury of having each type of machine tool segregated. The same goes for heat treating, cleaning and assembly.

BE sure you are modernizing a *job*, not just a machine. A new piece of equipment never gets a fair chance if units ahead and after it are still ancient klonkers and if feeding and workhandling devices are inadequate.

ANOTHER DoALL Achievement

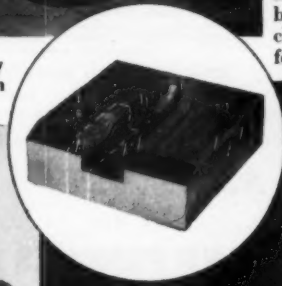
GRIND VERTICALLY

To Machine Heat-Treated Steel

Repair Broken Dies . . . Alter Finished Dies
Machine Hardened Materials . . . Cut Abrasive Materials

The new DoALL Line Grind band gives you a new machining term—"vertical grinding." This band, on the DoALL Contour-matic, performs amazing operations saving thousands of dollars in repairing or altering finished, hardened dies. It's the first machine and only cutting tool combination that will do precision "vertical grinding" on inside-outside and contour cuts.

In the die shop there has always been a need for just such a cutting tool in order to meet a production run by saving valuable dies that become broken, warped or need last minute alterations. DoALL Line Grind bands, having hundreds of abrasive segments mold-welded to the steel band, are available only for the DoALL Contour-matic machine which has the rigidity, pressure coolant and hydraulic feeding necessary for efficient Line Grinding operations.

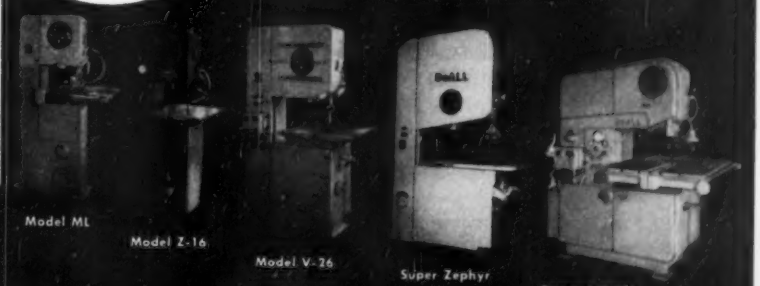


Die quickly repaired by removing broken section

DoALL Line-Grind Band Tool

At the A. S. M. Metal Congress in Chicago

SEE This new machining method "Line Grinding" and DoALL's complete line of Band Machines, surface grinders and gaging instruments in operation . . . Oct. 23-27, 1950
DoALL Exhibit Booth No. 606



DoALL

BAND MACHINES and TOOLS for EVERY PURPOSE

27 KINDS—Band Cutting Tools
for Line Milling, Line Grinding, Contour Sawing, Friction Sawing, Continuous Filing, Polishing, Honing
FOR DETAILS WRITE TO . . . . . .

The DoALL Company
Des Plaines, Ill., U.S.A.
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DoALL Stores in Key Cities

What should a PRODUCTION TOOL do for YOU...?

WHAT MUST IT DELIVER TO WARRANT the EXPENSE?

It Must Amortize Itself Rapidly, then Pay Dividends in Increased Production

DETROIT POWER SCREWDRIVERS

A GREAT CONTRIBUTION TO TIME AND LABOR SAVING

They replace the slow, dragging tempo of hand methods with the almost incredible speed of their mechanical operation, resulting in tremendously increased production, greater economy and stepped-up profits. They drive all types of screws: standard and special heads. Phillips heads and slotless heads. Driving time one to two seconds per screw . . . Uniform tension . . . No marring of heads or stripping of threads. **Screws always in sight of operator.** Let our experience as specialists in assembly problems serve your interests. Send sample assembly with screws for production estimate and prices on equipment to do your job by this modern, dividend-paying method.

Mail Coupon for Catalog

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Yes, send along your new catalog . . . sounds interesting.
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DETROIT POWER SCREWDRIVER CO.
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HIGH SPEED CARBIDE

MIDGET MILLS - ¼" Shanks
GROUND-from-the-Solid

ACTUAL SIZE

TEN LEADERS
MORE THAN 20 SHAPES—EACH IN SEVERAL SIZES
Obtain the best from the originator of GROUND-from-the-Solid

Severance JUNIOR MILLS-⅛"Shanks
GROUND-from-the-Solid

SET OF TEN

Practical for use on small grinders, for finishing Patterns, Dies, Parts, etc., in places difficult to reach with the larger Mills.

ACTUAL SIZE

HIGH SPEED and CARBIDE

Truly REVOLUTIONARY Cutting Tools

Severance LAB MILLS—3/32" Shanks

These speedy Mills for Dental Laboratories find many uses in Jewelry and in Die and Mold making. Available in 10 popular shapes in 4 or more sizes each, for the finest cutting and finishing. May be reground up to 8 times per ⅛" reduction in diameter

HIGH SPEED Cut-Pattern Dental Burs and Grinding Points

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Complete REGRINDING Service — by New Tool Craftsmen — Savings are thus multiplied —

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30° 45° INSIDE 30° 45° OUTSIDE HAND RADIUS

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STANDARD Chamfering SOLID (For Rubber Use)

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New SAMSON

Bench Type

HAND PUNCHES

- All Steel Construction
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PROMPT SHIPMENT

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SIZE	No. 8	No. 10	No. 13
Punches	5/16"	13/32"	7/16"
Through steel	¼"	5/16"	⅜"
PRICE	$37.40	$62.30	$75.65

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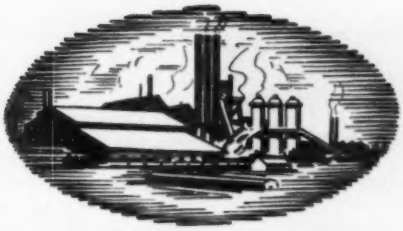

1900 ★ THE MIRACLE OF AMERICA ★ 1950

Freedom and Progress

It's no stretch of the imagination, rather, robust realism to call our past half century a Miracle—U. S. A.

America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the biplane? A far cry from our FM radio, television, hydro-matic drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

- Since 1900 we have increased our supply of machine power 4½ times.
- Since 1900 we have more than doubled the output each of us produces for every hour we work.
- Since 1900 we have increased our annual income from less than $2400 per household to about $4000 (in dollars of the same purchasing power), yet . . .
- Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

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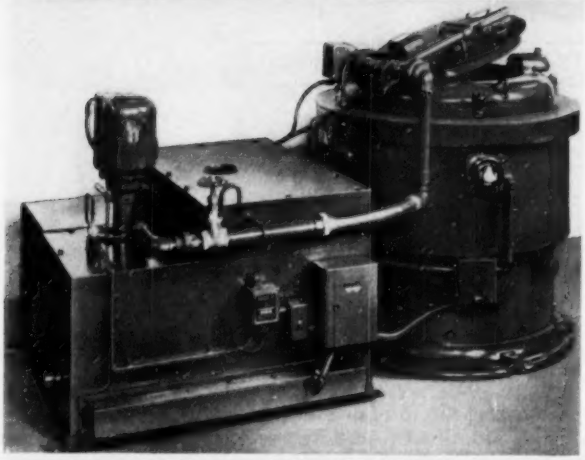
CONTROLLED IMPREGNATION by the BARRETT "HYDEWA" Centrifugal Process offers many advantages



The Centrifugal Process is limited in application only to the size of the articles that may be rotated in fair balance in the revolving bowl. Coils, condensers, transformers, braiding cotton insulated wire, paper tubes, pressboard spacers, rawhide and bristles, are but a few of the many typical products now being processed in Barrett Impregnators. Many products heretofore considered impractical for satisfactory impregnation by other methods have been successfully handled.

The Barrett Method assures fast production, by reducing the customary hours to minutes, high penetration, with controlled impregnation, also positive expulsion of air from the articles being impregnated.

Basic units are self-contained, direct motor driven. Special arrangements and supplemental equipment also provided.

Submit your problem and samples for test and recommendations.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Want a FASTER job?

Get a BETTER pump!

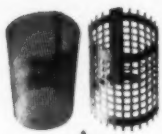
RUTHMAN GUSHER MACHINE TOOL COOLANT PUMPS

Split-second, copious coolant flow, simplified design, precision built for longer life make Ruthman Gusher Coolant Pumps your best bet for a coolant pump that will help you speed production on your metal cutting machines. Write for our catalog today. There's a type and model Gusher Pump to fit your needs.

THE RUTHMAN MACHINERY CO.
1818 READING ROAD, CINCINNATI 2, OHIO

Perforated METALS Fabricated, Too! at H & K

- *Limitless Pattern Variety*
- *Wide Range of Materials*
- *Forming Assistance and Facilities*



FOR THOSE SPECIAL APPLICATIONS where Perforated Metals must take special form (filter plates, trays, conveyor linings, automotive radiator grills and such), H & K offers complete fabricating facilities PLUS the experience of 66 years in precision perforating. H & K is fully equipped to roll, shear, braze, weld and otherwise fabricate to your specifications.

H & K RECOMMENDATIONS will assure you of well chosen metals and alloys (non-metals, too) with all the desirable features of corrosion resistance, strength, smooth easily cleaned surfaces, dependably accurate patterns, etc., at low cost.

Also Remember—H & K Grilles . . . Ultimate in Beauty . . . Utility . . . LONG LIFE!

The Harrington & King PERFORATING Co.

Metalworking Is America's Biggest Industry!

The 1947 U.S. Government Census reports 44,923 metalworking plants in the following categories:

Manufacturers of Fabricated Metal Products	16,734
Machinery (except electrical)	17,906
Electrical Machinery	3,973
Transportation Equipment	3,711
Instruments and Related Products	2,599

In 1947, these plants employed 4,731,820 people . . . industry's largest labor force. Of these people, 4,321,684 worked for the 10,151 plants that employ 50 or more workers each.

Metalworking is big . . . active . . . growing. And *American Machinist* is the metalworking magazine more metalworking men read than any other. They read this magazine because its editorial and advertising pages are their most useful and diverse source of information on the production methods and equipment through which Metalworking can keep on growing . . . and doing a better job of serving its customers.

American Machinist

The McGraw-Hill Magazine of Metalworking Production

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Class 3 Fits

diam. from .086" to .190"
thread lengths from ⅛" to 1½"

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Please send me free Bulletin TB-100 describing your Automatic Thread Roller.

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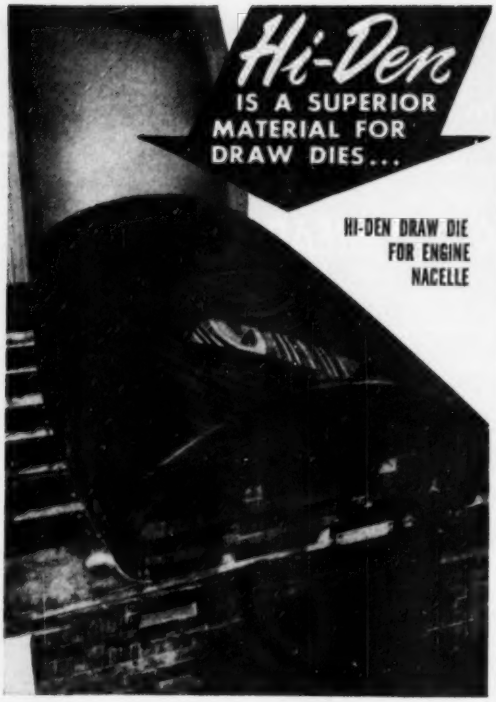
From The *American Machinist* Library of *Tips for Top Shop Men*

TO MAKE a man who works for you feel tops, ask his advice. It's an old rule that if you want a man to like you, get him to do you a favor—advice is something the giver values more than gold.

ARE your stockbins clean? Do you know what's in them? Are numbered parts and tools in numerical order so they're easy to find—or is each new thing chucked into the nearest vacant bin? If you want to save costly searching time, get system into stores and cribs.



NOW . . . make your DIES of Hi-Den and save 83% of fabricating cost!

You can use standard tools of tungsten carbide or even high speed steel to shape your drawing dies—large or small.

HI-DEN, made from selected wood veneers impregnated with phenolic resin (laminated and compressed at extremely high pressures), is **far stronger than equal weight in steel!** It has been successfully used for nearly 10 years in the aircraft and other metal working industries for dies, jigs, pressure pads, spinning chucks, etc.

Amazing savings are being made with Hi-Den in some of the country's largest plants. An aircraft manufacturer* found over 100 different applications for it; a bus manufacturer* used Hi-Den for forming and draw dies, got a **50% greater depth of draw** than when using a steel die, never had a breakdown or replacement in a 3-year period, and some dies produced **more than 8,000 parts!**

Hi-Den is stronger, has a low coefficient of friction, is superior in drawing sheet metals, is lighter in weight and easier to handle, has dimensional stability and is **extremely versatile.**

INVESTIGATE THIS REMARKABLE NEW MATERIAL!

Send today for technical bulletin "HOW TO USE Hi-Den" to improve quality while reducing costs.

*Name on request.

Parkwood Corporation
28 Water St., Wakefield, Massachusetts

FOR SHARPENING . . .
- Milling cutters
- Gear cutters and reamers

GRAND RAPIDS No. 60
Universal cutter and tool grinder

Features:
- Anti-Friction Bearing Table
- Four Spindle Speeds
- Two Work-Head Speeds
- Greased-for-Life Spindle
- Bijur, one-shot lubrication system

Your letter will bring you complete information and specifications.

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330 Straight Ave., S.W., Grand Rapids 4, Michigan

ACCURACY
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These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hesitate to consult us, our experience in this field is most comprehensive.

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BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
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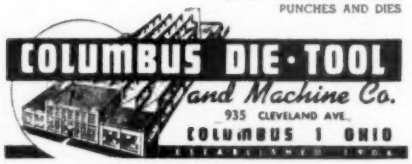


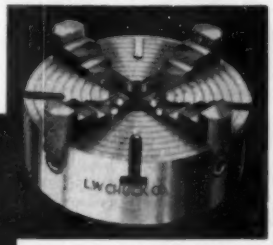
OUR BUSINESS HAS BEEN BUILT ON SELLING FINE CHUCKS FOR LESS MONEY!

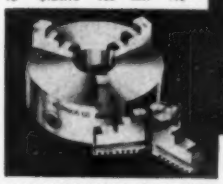
Stretch your chuck dollars with the

L-W 6" HEAVY DUTY INDEPENDENT 4-JAW LATHE CHUCK

RUGGED • ACCURATE **AN UNBEATABLE VALUE AT ONLY . . . $19.67**

		Weight	Jaw Width
6"	$ 19.67	11½ lbs.	⅝"
8"	$ 24.67	20 lbs.	¾"
10"	$ 53.97	55 lbs.	1¼"
12"	$ 61.85	75 lbs.	1¼"
14"	$ 71.65	91 lbs.	1¼"
16"	$ 94.22	140 lbs.	1½"
18"	$124.16	160 lbs.	1½"





sets of accurately cut hardened and ground steel reversible jaws. Cast semi-steel body ground to fine finish.

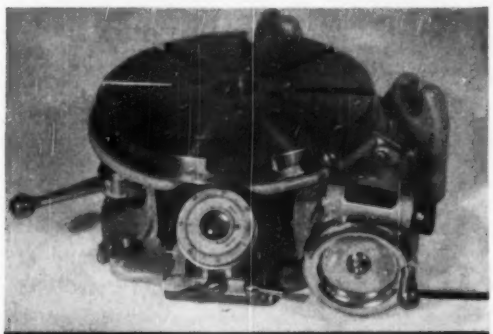
L-W UNIVERSAL 3-JAW LATHE AND SCREW MACHINE CHUCKS

Fit any lathe having 1⅝"-8 thread spindle. Using buck adapter plate, they mount on any size or type. Fit L-W 6½" SD Dividing Head. 3 tough hardened steel pinions. Two

		Weight	Jaw Width
5"	$27.20	9 lbs.	⅝"
6¼"	$37.84	18 lbs.	¾"
7½"	$47.57	25 lbs.	¾"
10½"	$99.55	70 lbs.	1"

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 2550 ST. CLAIR ST. TOLEDO 4, OHIO



presenting **OPL Optically Controlled ROTARY INDEXING TABLE**

Incorporating many distinctive features, this new optically controlled rotary indexing table is offered you following the wide success met by our OPL Dividing Head:

Features

- For use on machines permitting operators to index and divide their work with a speed and accuracy not possible with mechanically controlled equipment.
- Accuracy.
- Ease of viewing (even at 12-inch distance).
- Will operate in either vertical or horizontal position.
- Constructed for long life of finest alloy irons and steels.

Write us today for details.

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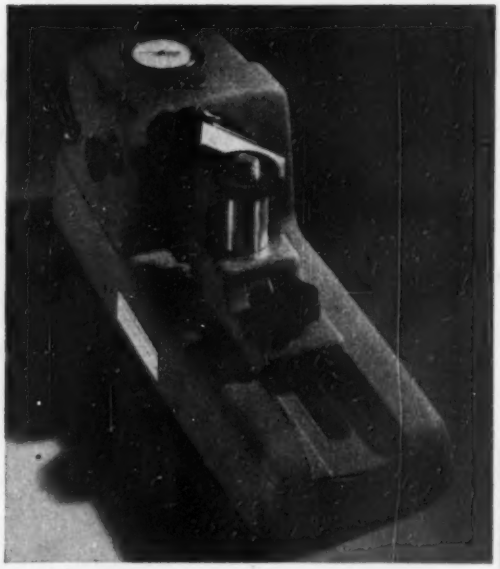
305 W. LANCASTER AVENUE **WAYNE, PENNA.**

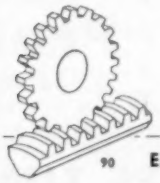


NEW PRINCIPLE CHECKS GEARS AT MACHINE SIDE easily and accurately

The Kodak Backlash Gage is a machine-side application of the Kodak Conju-Gage principle, a time- and money-saving method for passing every good gear, rejecting every wrong gear.

Built especially for the needs of the men who machine your gears. A great help in setting up accurately and in holding backlash and size tolerances *with respect to the hole.* Avoids clumsy manipulation involved in old-fashioned methods.

Fully illustrated twelve-page booklet describes the Kodak Backlash Gage and the Kodak Conju-Gage Gear Checker principle. It's full of new ideas on gear-testing. Write for it.



Kodak

CONJU-GAGE

90 **EASTMAN KODAK COMPANY**

Industrial Optical Sales Division

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Please send your booklet on the Kodak Conju-Gage.

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Kodak

Up to 50% production increase on large hole tap jobs!

—with NEW Procunier "TAP KING" Heavy Duty Tap Head

This revolutionary new Procunier "TAP KING" will change every idea you've ever had about *large hole* production tapping! More and more users are finding that it slashes cost . . . makes possible sensational increase in production on difficult large hole tapping jobs! Spectacular daily *production gains have run as high as 50% to 100%!* In addition, users reported amazing savings in parts spoilage and consistent, accurate maintenance of uniform tap depth . . . even on large *blind hole* tapping jobs!

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NEW! LARGER!
Procunier "TRU-GRIP" Tap Saver

Compact size makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter, it drives the tap by the square, holds it true by the round.

PROCUNIER SAFETY CHUCK CO.
Dept. 10, 14-18 S. Clinton St.
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Gentlemen: Please send me full details on the new Procunier "TAP KING" Heavy Duty Tapping Attachment.

NAME .....

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CITY .....ZONE....STATE.....

Here is the answer to your toughest large hole tap problems . . . write for full details today! PROMPT DELIVERY.

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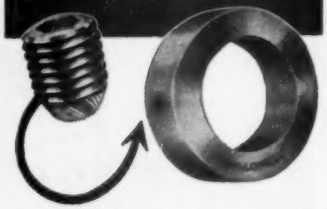
HALLOWELL

Steel Collars



HALLOWELL Solid Steel Collars, functionally proportioned throughout . . . precision-machined so faces run perfectly true . . . are beautifully polished all over . . . yet they cost less than common cast iron collars. 3" bore and smaller are made from Solid Bar Stock. To make sure the collar won't shift on the shaft, they are fitted with the famous UNBRAKO Knurled Point Self-locking Socket Set Screw — the set screw that won't shake loose when once tightened. HALLOWELL . . . a "buy word" in shaft collars . . . available in a full range of sizes for IMMEDIATE DELIVERY.

Write for name and address of your nearest HALLOWELL and UNBRAKO Industrial Distributors.

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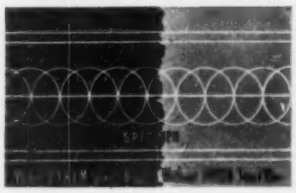

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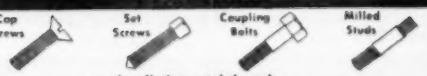

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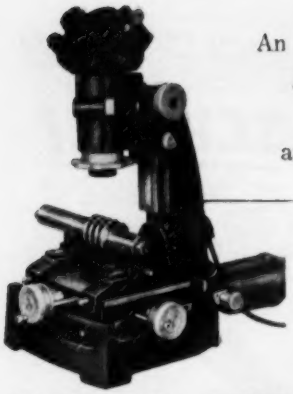

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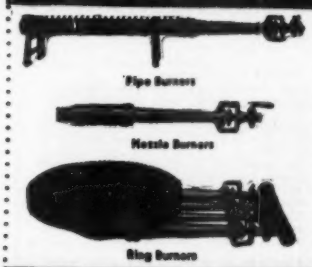

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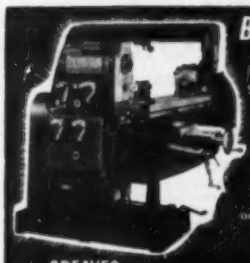

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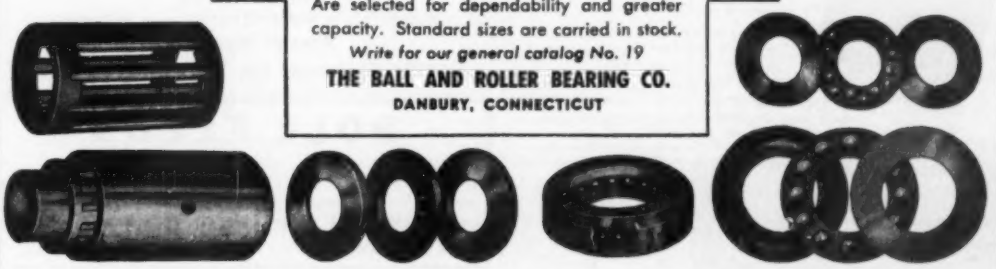

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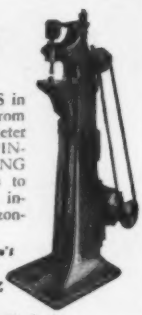

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No. 11 Blanchard Vertical, m.d., 10" chuck
No. 16 Blanchard Rotary, m.d., 26" chuck
No. 22—12" Heald Rotary, m.d.
No. 25A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 70 Covell-Hanchett Hydraulic, m.d.
No. 269—16" Heald Rotary, belt
10x12x80" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
16x28x48" Thompson, m.d., latest
22" Pratt & Whitney Vertical, m.d.
34" Bridgeport Knife, belt
84" Diamond H.D. Face Grinder, m.d.

HONING MACHINES
H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle Honing Machine, m.d.

TOOL AND CUTTER GRINDERS
No. 2 LeBlond Universal, m.d.
No. 10 Brown & Sharpe, m.d., latest
No. 13 Brown & Sharpe, m.d., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 6T Sellers Tool, m.d., latest
Barber-Colman Model HRS Combination Cutter Sharpener, m.d., late

MANUFACTURING LATHES
No. 3A Lodge & Shipley Duomatic, m.d., late type
No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x18", 3½x30", 4x60", 6x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 57, m.d.
13"x24" LeBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13"x36" LeBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.
16"x6' LeBlond Rapid Production, m.d.
16"x6' Lodge & Shipley Simplified Mfg., cone, motorized
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Automobile Mfg., cone
20"x8' LeBlond Mfg., m.d.
21"x8' LeBlond Turret Lathe, cone
Niles-Bement-Pond Quartering Machine, m.d., new
Bekaert Type NA 2B Speed Lathe, m.d.

PLAIN MILLING MACHINES
No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1 Special Plain Kearney & Trecker Milwaukee, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2 Rockford, m.d.
No. 2H Milwaukee, m.d.
No. 3 Cincinnati H.S. Dial, m.d., latest
No. 3 Cincinnati H.P., m.d., n.r.t., late type
No. 3B Brown & Sharpe, m.d., late
No. 3, 4 Kempsmith Maxi-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 4K Milwaukee, m.d., late type
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No 5B Brown & Sharpe Heavy, m.d.
No. 4K Milwaukee, m.d., late type

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MElrose 1241
CABLE ADDRESS EMCO

AARON FOR ONE OF THE LARGEST STOCKS OF MODERN MACHINERY AT LOWEST PRICES—MONEY BACK GUARANTEES

AUTOMATICS
Cone 4 Sp. 1⅛" Auton.
Fay Automatic, 12"x81".
Lodge & Shipley Duomatic 2A

BORING MILLS
Giddings & Lewis No. 0, No. 2ST.
Lucas No. 31, horiz.
Heald #49 double spindle, #48A Borematics
Universal 3" horiz. equipped.
Bullard 24", 36", 42" VTL
King 72", 42" vertical

DRILLS AND RADIALS
Barnes No. 242, No. 5 Morse
Carlton 8'-19" column
Canedy-Otto 3'-9" col.
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

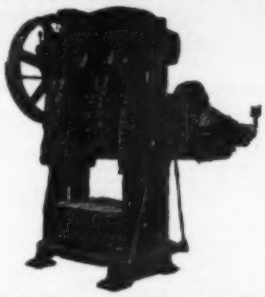
ENGRAVERS
Gorton No. 3U, 3Z.
Deckel G2, 2 dimen & G1L
Gorton Cutter Grinders 876-2, 265-4.

GEAR EQUIPMENT
Fellows #7, 72, 713, 725, 7125, High Speed.
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener.
Gleason 8" Spur Bevel Generator
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18", 3" x 12".
B. & S. Nos. 1, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Bryant #16 Internal
Cinn. 12x48", & 12x36" Filmatic Univ.
Cinn. #2 Univ. Tool & Cutter
Covel No. 91A Univ. T. & C.
Dalzen Thread, latest
Gardner #226, 30" Disc.
Hanchett #228 Disc. Dbl. opposed w. M.D. Feed.
Heald 72A3 Sizematic Int. Centerless
K.O. Lee Tool & Cutter.
Landis, 10x24" type C Univ., 10x36" angu., centreless
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 4G Drill Grinder
Wickman Profile

GRINDERS, SURFACE
Abrasive No. 33, 34 Vert. 8x24.
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe #25, 8x24"
G & L Hyd. #25, 6x18", #35, 8x24", #45, 12x24".
Hanchett Model 300, 13 x 48".
Norton 6x18", and 10x36" Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Motor Spdl. Hand Feed.
Thompson Hyd. 6 x 18 x 18", 6 x 12 x 18"

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap.
Hendey 12" x 42" GH.
LeBlond Heavy duty 16"x30".
LeBlond Regal 10"x18½', 13"x24". 15"x30", 16"x48" TA. 19"x48". TA, 21"x60"
Lodge & Shipley 20"x54" G.H. 24 Spindle Speed latest



Bliss Double Crank Toggle Press No. 406—48"

Bliss #3½A Toggle Press Geared, 1½ Toggle
Bliss No. 304A, 75½ (330 ton) Straight Side Presses.
Bliss 650 High Production Presses.
Cincinnati 36-72 Hydratel Horiz. Miller latest type.

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	48½"	35 x 36
H.P.M. Double Action	500	24"	30"	34 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed.
Denison	25/50	18"	23"	22 x 20
Hannifin	50	20"	30"	22 x 30
Southwork, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	48½"	42 x 32

UP MOVING RAM PRESSES

Southwark	600	20" 27" to 48"		34 x 24
Waterbury Farrel	800	6½"	28"	22 x 24
Birdsboro	800	20" 30" to 48"		40 x 32
Watson Stillman	300	12"	21"	24 x 28
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	4"	12"	18 x 18
Stewart Bolling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES — 600 ton 96" 500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (12 gal) Hydr. Pass.	42 x 9 x 48"	3000

Lodge & Shipley 16 x 78" T.A., Collets, etc., 20"x54" 24 speed G.H.
Monarch 10"x20" EE.
Monarch 12x30" Dble. Compound, 18", 13"x36" CKK
Rivett 608 QCG, TA, Precision
South Bend Q.C.G., 13"x8', 16"x4'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21
Cincinnati No. 2-18 Mfg., 50-96 hydromatic
Kent Owens IV, 1-8
U. S. Multimiller, 1 & 2 Spindles.
Sundstrand 00 Rigidmills

MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2A Univ.
Cincinnati No. 2 Plain, 2M Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain, 2 HL
Van Norman Duplex, 20.

MILLS, VERTICAL
Brown & Sharpe No. 2 Standard
Cincinnati No. 3 Hi-Speed Dial Type.
Cincinnati No. 4, Hi-Power.
Gorton No. 8½ D Profiler
Morey No. 12M Profiler 3 sp.
Sipp MPS Jig Borer
Fosdick #30 Jig Borer.
Pratt & Whitney #2 Jig Borer

PLANERS
Detrick & Harvey 48"x48"x18' open side 2 Rail heads, 1 side head.
Hamilton 30"x30"x10' double housing.
Hamilton 36"x36"x22' double housing.

PRESSES
Bliss No. 18, 19, 20, 21, OBI.
Bliss No. 304A, 4" Str. 23"x24" bed, S.S.
Bliss No. 645B, 650 Hi-Production, 58, 62, 62A, 162.
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Henry & Wright Dieing, 75 Ton.
Z. & H. 30 Ton, O.B.I.
Stokes Tablet Presses, Model R & T, DD2.
V&O #01

TURRET LATHES
Acme No. 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1⅛" cap., No. 5, Chuck.
Brown & Sharpe 2F
Foster No. 3B.
Gisholt No. 4, Bar and Chuck, 2L, Saddle Type
Jones & Lamson #5 Univ. Preselector head, PRT
Warner & Swasey #2, 4 Preselector
Warner & Swasey No. 4A 8" Cap.

MISCELLANEOUS
Band Saw: DoAll 36" Zephyr, Tannewitz No. 36M.
Bending Roll: Webb ¼"x5', BR-3
Centering Machine: Sundstrand.
Comparator: J & L 14" podmtal & bench.
Hacksaw: Marvel Nos. 6 and 6A, 9A Automatic Feed.
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C32.
Pin Machine: Nilson.
Profilers: Cinn. 360° 4 Sp., Morey 12M
Shaper: Cinn. 24" Universal. Sheldon 12" Brand New.
Rotary Shear: Quickwork 3/16" Cap, 36" throat circle cutting attach.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis.
Lappers: Ultralap.
Rivet Hammers: Hi Speed.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Tapper: Bakewell #1, #2
Haskins No. 3C, 3CAM.
Welders: Spot & Seam: Thompson, Taylor, Winfield.
Wrapping Roll: #1½ Buffalo

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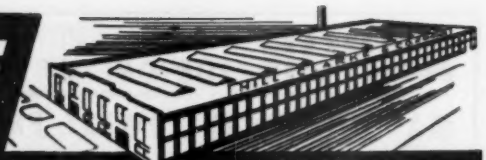

ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

AUTOMATICS
No. 49 New Britain, 4 Spdl. Chucker

DRILLS
No. 4—B Edlund S.S. No. 3 Taper
No. 1—LM2—L. Gifford—4, 5 Spdls. (1942)
No. 2—LM3—L. Gifford—Avey 1, 2, 3, 4 Spdls.
No. 4BL Natco 36 Spdl. (1943)
3'-4'-16" Col. American Radial
4'-15" Col. American Hole Wizard

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 5A Lees-Bradner Gear Generator
No. 12 Gleason Bevel Gear Generator
No. 5—60" Brown & Sharpe Gear Cutter
72" Cincinnati Gear Cutter
No. 3 Barber-Colman Hob Sharpener

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
No. 32 Giddings & Lewis, 3⅛" bar
No. 32 Giddings & Lewis, 3½" Bar
No. 3 Lambert 4" bar
No. 46 B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
24" Bullard New Era
36" Bullard New Era
42" Bullard New Era
42" King
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
4"x18" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x96" Landis Type C hydraulic (1942)
Norton Motorized Grinders ranging from 6"x18" to 24"x184"
12"x36" Cincinnati Universal (1945)
No. 5 Bryant Internal Grinder
No. 3 Abrasive Surface Gdr.
No. 34 Abrasive Surface Grinder (1943)
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 16—32 Bryant Internal Gdr.

LATHES
18"x6' American, Gdr. Head, M.D.
18"x8' American Gd. Hd.
24"x14' American Gd. Hd., Taper
24"-27"x22' Lodge & Shipley
36"x16' Betts—Bridgeford Grd. Head
36"—48"x16' Lehmann Hydratrol (1945)
8"x15" Sundstrand, Model B (1943)
10"x22" Sundstrand, Model AA (1943)
20" Fay Automatics (1943)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby (1942)
No. 1A Warner & Swasey, Bar Fd.
No. 1-H Libby, Extra Long Bed (1942)

MILLING MACHINES
No. 3B Milwaukee Plain
No. 4 Cincinnati H.P. Plain
No.5 Cincinnati H.P. plain
No. 3 Cincinnati Universal
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mlg. (1942)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
No. 3-24 Cincinnati Hydromatic (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
No. 56-90 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model LT (1943)
10"x48" Hanson-Whitney Thread (1942)
48"x24"x12' Ingersoll Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x8' Travelling Col. Face Millers (1942)
No. 36—120 Cincinnati Horizontal Hydrotel

MISCELLANEOUS
20" American Hvy. Shaper
36" Ohio Shaper
18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads
144"x76"x48' Liberty Openside Planer

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LATE MODEL MACHINE TOOLS . .

AUTOMATICS
No. 49 New Britain Chucker, 1941.
12"x21" Fay Automatic, 1942.

BOLT MACHINES
No. 500C Manville Thread Roller. Latest.
No. 250C Manville Header, 8880. Latest.

BORING MACHINES
62" King Vertical, 1942.
48 & 49 Heald Single End, 1943.

DRILLS, RADIAL
4'-15" Canedy-Otto, 1943.
6'-15" American Hole Wizard, 1941.

GEAR EQUIPMENT
12" Gleason St. Bevel Gen. 1942.
No. 6 Gleason Ravacycle, 1941.
No. 6 & 17 Gleason Testers, 1941.
8" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver, 1942.
No. 645A3, 615A & 61A Fellows, 1944.
No. 72 Fellows Shaper, 1943.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL
25"x48" Landis Crankshaft. Like New.
16"x36" Cincinnati Plain, 1942.
12"x30" Landis Univ. 1941.
10"x72" Landis Plain, 1942.
10"x18" Norton Plain, 1942.

GRINDERS, INTERNAL
No. 172 HEALD Gap, 1940.
No. 72A & A5 Heald Rotary, 1943.
No. 73 Heald Hydraulic, 1942.

LATHES, ENGINE
27"x96" LeBlond, 1942.
16"x54" American Pacemaker, 1943.
16"x54" Reed-Prentice, 1942.
14"x30" Bradford, 1942.

LATHES, PRODUCTION
No. 3A L&S "Duomatic", 1943.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 10 Sundstrand, 1942.
14"x42" Monarch "Magna-Matic", 1941.

LATHES, TURRET
42"x96" Bullard Vertical, 1943.
No. 3A Warner & Swasey, 1941.
No. 4A Warner & Swasey, M.D.
No. 1 & 8⅛"x24" Acme Univ. 1943.
No. 2 & 4 Warner & Swasey, 1942.
No. 3, 5 & 7 Bardons & Oliver, 1942.
No. 3R Gisholt, 1943.
No. 3H Libby, Late.

MILLS, PLAIN
No. 3B Brown & Sharpe, 1941.
No. 36 Van Norman, 1942.
No. 28 Van Norman, 1942.

MILLS, PRODUCTION
No. 1-14 & 2-20 Kent Owens, 1942.
No. 1224 Kearney & Trecker, 1942.
No. 3-36 Cincinnati Duplex, R. & F. 1942.
No. 3-36 Cincinnati Hydromatic, 1942.
No. 1-18, 2-18 & 2-24 Cincinnati, 1942.

MILLS, THREAD
12"x54" Lees Bradner, 1943.
6"x36" Lees Bradner, 1942.
4"x9" Hanson Whitney, 1942.

MILLS, UNIVERSAL
No. 2MH Cincinnati, 1942.
No. 2H Milwaukee, 1942.
No. 28U Van Norman, 1942.

MILLS, VERTICAL
No 3H Milwaukee, 1942.
No. 2 Cincinnati, 1942.
No. 1 Cleveland, 1942.

PRESSES
50 Ton Denison, Hyd., Str. 1942.

WELDERS
150 KVA Federal Seam, 1943.
60 KVA Federal Spot, New.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

UNUSUAL VALUES

Milling Machines—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 5—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 12"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x8', 8', 10'—10"x6', 3', 10'—18"x6', 8', 10'—36"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 36"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x16" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for sizing draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

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AUTOMATIC SCREW MACHINE, #6 7/8" Four Spdle. 5 h.p. 5 sets of collets. Tooling. Serial #15085.
AUTOMATIC SCREW MACHINE, #00 Brown & Sharpe, Cap. 9/16", Slotting Attachment, Coolant System, etc. TWO.
AUTOMATIC SCREW MACHINE, #2 Brown & Sharpe, Cap. 1", Collet, Collet Chuck, toolposts, Coolant System, etc. FOUR.
AUTOMATIC SCREW MACHINE, #20 Brown & Sharpe, Cap. 1", 2 h.p. 220/440 volts. Collet, Collet Chuck, Coolant System, etc. THREE.
BORING MILL, Bullard 54" Vert. Spiral Drive.
BOREMATIC, Heald #49 Sgle. End. W/Univ. Fixture. 220/440 volts.
BROACH, Oliver 10 Tons Horiz. 56" Str.
BROACH, LaPointe #3B. 25,000# 56 Str. 2-speed
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95. 5 h.p., 220 volts. Four Speeds up to 2700 r.p.m. Floor model.
DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24". 15" C.C.
DRILL, Cincinnati 21" Bgrd. Drilling & Tapping.
DRILL, Radial, Cincl-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, L. Gilfords #2MB 14", 11" C.C. 3-Spdle
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine. 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 8 speeds, 12½" throat, 9" Capacity in steel.
DRILL, Leland Gilford #2LMB Upright Sliding Head Two Spindle, #2 taper, 13" overhang. Independent 220 volts, 4-speed motors, indicated spindle speeds.
DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles, Rectangular head. With Natco 24" Rotary Table.
STRAIGHT BEVEL GEAR GENERATOR 3" Gleason, Serial #108094, NEW—1942, 220/440 volts motors. Gear Cabinet, Full Set of Index Gears, Segments, Auto-Index Attachment, Pneumatic Chuck Equipment, Cutter Setting Gauges & Segment Setting Gauges, Duplete Cutting Cam & Duplete Feed Cam.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

BASE PITCH & SPACE MEASURING MACHINE, #357 Illinois, Late Type—Like New. Capacity—12" diameter gear, 12" between centers. Full Set of OD-Rot and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.
THREAD GRINDER, J & Lamson #TG-615 Automatic, Late Type
GRINDER, Blanchard #16, 28" Chuck Vert Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 18" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics, Hydraulic Infeed.
GRINDER, Covel #76, 8x24 Hydraulic Horiz. Surface.
GRINDER, Norton 6x18 Hydraulic Vert. Rotary Auto. Excello Spdle.
GRINDER, Norton 6x18 Hydraulic Horiz. Surface. Excello Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary, 84" table travel.
GRINDER, Reid #2-B All-Electric 6x18 Auto. Horiz.
GRINDER, Thompson 6x18 Hydraulic Horiz.
GRINDER, Bath 18"x28" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls, Internal Grinder Attachment & Blandy Heat, etc.
316 BORER, Pratt & Whitney #2, W/Indicators & Collets.
KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.
LATHE, American 27"x16' Grd. Hd. 12 speed. Taper Attach. & Chuck.
LATHE, LeBlond 30" x 39', 220/440 motor, 12 speed head, taper attachment, steady rests, etc.
LATHE, Bridgeford 26"x14' Q.C.G. 8'3" C.C. 220 volts two speed motor.
LATHE, Hardinge #30 High Speed Second Operation Machine, 1" Collet Cap, Automatic Collet Mechanism, collets, collet chucks, etc. FOUR.
TURRET LATHE, Bardons & Oliver #7 Universal Grd. Hd. Ram Type. Hydraulic Speed Selector, 2½" Cap. 10 h.p. 220/440 motor, With Chuck, toolholders, etc.
MILLING MACHINE, Van Norman #3SP Horiz. 34x12x18, Late Type.
MILLING MACHINE, Cincinnati Vertical #3 H.B. Dial Type. W Rotary Table.
MILLING MACHINE, U. S. #MMI-6 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors. TWO.
MILLING MACHINE, Van Norman #3V Ram Type Vertical, Late Type, 220/440 motors. Also vtch arbors, arbor, vises, collets & cutters.
PRESS, Bliss Consolidated #5½ O.B.I. 4" Stro. 220/440 volts. 40 tons.
TURRET LATHE, W & S #4 Univ. Grd. Hd. 12 speed, Bar Feed W/tooling.
O.B.I. PRESS, Bliss #21B. 40 tons. 2½" Stroke.
O.B.I. PRESS, Bliss-Cen. #5½, 42 tons. 4" Stro.
POWER PRESS, Bliss #94 S.S.S.A. 50 tons. 10" Stroke. 20" between uprights.
POWER PRESS, Bliss #75½ S.S.S.A. 128 tons. 5½" Stroke. 24" between uprights.
POWER PRESS, Bliss #5A S.S. Obie. Crank S.A. Grd. 45 tons. 4" stroke. 20" between uprights.
WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 48" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.
POWER PRESS, Bliss-Consolidated #77 Open Back Gap Frame Sgle. Crank Sgle. Action Back geared. 175 tons, 10" stroke, Bed area—24" x 42", With Roll Feed and Roll Straightener.
POWER PRESS Ferracute #90 Double Crank Sgle. Action, S.S. Geared, 90 tons, 1¾" stroke, Bed area —61½" x 27½".
POWER PRESS — Bliss-Consolidated #181-B Straight Side Obie. Crank Single Action, 40 tons. 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.
SHEAR, Gap Squaring, Niagara #0126B, 10'x½" Overdriven. 10" Gap. 20 h.p. motor, 220 V. spring hold-down and extra blades.

LATE TYPE MACHINE TOOLS

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GRINDERS

6"x18" Cincinnati Plain Hydraulic
6"x18" Cincinnati Plain Hydraulic
10"x18" Norton Model C Plain Hydraulic. 1942
14"x48" Cincinnati Plain—1942
8" No. 20 Heald Rotary Surface
12" Arter Model A3 Rotary Surface
No. 25A Heald Hyd. Rotary Surf. 27" Chuck
No. 300 Hanchett Hyd. Vertical Surface
14" Pratt & Whitney Hydraulic Surface

PRODUCTION MILLING MACHINES

#1 Sundstrand Rigidmil
#3 Sundstrand Rigidmil
#34-36 Cincinnati Hydromatic Plain—tracer cont. 1941
#56-86 Cincinnati Hydromatic Plain—1940

NUT AND BOLT EQUIPMENT

#188F Manville SSSD Ball Header
#250C Manville SSSD Header
¼" National Precision Nut Tapper
#2 Waterbury Farrel Nut Tapper

LATHES

#10 Sundstrand Automatic Lathe
14"x30" Hendey, Geared Head, 1942
20"x48" Lodge & Shipley Geared Head, 1942
42"x108" Niles Heavy Duty Geared Head. 1943
No. 3 Hendey Hi-Speed Turning Lathe

VERTICAL MILLING MACHINES

#2 Cincinnati Dial Type Medium Speed—1942
#2 Standard Brown & Sharpe 1942
#3V Van Norman—1943

PLANERS

48"x48"x16' Cincinnati Hypro Double Housing, 1941
48"x48"x26' Niles-Bement-Pond
120"x96"x20' Cincinnati

PLANER TYPE MILLER

84"x72"x16' Ingersoll Adjustable Rail—1942

TURRET LATHES

#1 Warner & Swasey Electric Head—1940
#5 Warner & Swasey Universal Geared Head—1946
#3A Warner & Swasey Universal Geared Head
#3R Gisholt Geared Head

MISCELLANEOUS

#3 LeBlond Rifling Machine—1941
W. F & John Barnes Horiz. Honing Machine—1942
No. 420 W. F. & John Barnes 2 Spdl. Deep Hole Driller & Borer. 1942
No. 12 Bertsch Seven Roll Plate Straightening Roll—1942

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48"x26' c.c. American "Super Productive," lathes, 2.
10"x20" Monarch EE lathe, taper, collets, '41.
#2M Cincinnati Plain Milling Machine, '41.
36" Rogers Vert. Turret Lathe, '42.
16" GOULD AND EBERHARDT Universal Shaper, Pwr. Dwn. Fd., '41.
10"x24" Landis Univ. Grinder, type C, '42.
#34 Abrasive Vert. Surface Grinder, late.
6"x18" Norton Surface Grinder, late.
#4 Cincinnati Plain Milling Machine, Rect. Arm.
3" Gleason bevel gr. generator, '42.
#75A Fellows gearshaper, '41.
14"x30" Sidney Lathe, Mtr. in Base, Timken, Taper
#45 Giddings and Lewis 4½" horiz. mill.
3" Universal horiz. boring mill.
#2MS Leland Gifford 3 spdle. drill.

[WANTED: Yes, we want good machine tools in any quantity. Call or write us today.]

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LATHES

14"x59" ctrs Hendey "ECM" 18-speed, AC MD, taper
16"x56" ctrs Hendey "ECM" 18-speed, AC MD, taper
18"x96" ctrs Lodge & Shipley Selec. Grd. Hd., AC MD
24"x84" ctrs American Hvy. Pat. Grd. Hd., AC MD, taper
24"x102" ctrs Lodge & Shipley, Turner Drive, taper

MILLERS

#1-B Milwaukee DOA Plain, AC MD
#2-1B Cincinnati Automatic "Rise & Fall", new 1942
#2 Cincinnati Universal, Turner Drive
#2-A Brown & Sharpe Universal, AC MIB, div. hds.
#2-B Milwaukee Universal DOA, AC MD, div. hds.
#2-B Milwaukee Plain DOA, AC MD
#4 Cincinnati H.P. Universal, Lima Drive, div. hds.
6"x36" Model LT Lees-Bradner Thread, new 1942

PLANERS

22"x22"x6' Cincinnati, 1 head, B.D.
28"x28"x6' Cincinnati Tu-Speed, AC MD, 1 head, box table
30"x30"x18' Whitcomb, AC MD, 2 heads
36"x36"x16' Gray, AC MD, 4 heads
36"x36"x18' Gray Extra Heavy Pattern, B.D.
42"x42"x10' Niles-Bement-Pond, B.D., 3 heads, box table
42"x42"x14' Niles-Bement-Pond Heavy Pattern, D.C. var. speed drive, 4 heads, box table
72"x60"x14' Cleveland Openside, D.C. var. speed with A.C. generator, 3 heads

BORING MILLS

36" Bullard "New Era" VTL, SPD
36-44" Niles-Bement-Pond VTL, arr MD
42" Bullard "New Era" VTL, AC MD
48" Gisholt, arr MD, 2 rail heads
#3A Universal Horz., 3" bar, SPD

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All Late Type

54" Bullard Vert. Turret Lathes (2), latest type
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4" and 6" Sellers Horizontal Boring Mill
3" Universal Horizontal Boring Mills (2)

40"x15' LeBlond Engine Lathe, latest type
Bullard Multaumatics, 16", 12", 8", late
Sgl. Spdl. Cleerman (1949)
Sibley (1941) Drill Presses, #5 M.T.
#28/60 Cincinnati Hydrotel 4 Spdl., '44
9/16", 2¼", 2½" RA6 Acme Gridley Auto.
20" Gould & Eberhardt Shaper
Hardinge Multipurpose Chucking Machine, 1950
60" Bickford Vertical Boring Mill
75 Ton Henry & Wright Dieing Press
Kane & Roach 5 Station Roll Former

CHUCKERS

6" 6 Spdl. Acme Gridley and 6" 8 Spdl.
#865 New Britain Chuckers. (3)

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MODERN MACHINES

#35 Landis Horizontal Boring Mill, 3½"
24" Bullard New Era Vertical Turret Lathe
8"x48" Jones & Lamson Thread Grinder
10"x48" Norton Plain Cylindrical Grinder
6'17" Carlton Radial Drill
#2 Kearney & Trecker Plain Miller
28/120 Cincinnati Horizontal Hydrotel Miller

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No. 1 W & S Turret Lathe.
Seneca Falls Short-Cut Lathe.
Hanna 80-ton Pneu. Yoke Rivetor.

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Model No. 60, Kane & Roach, Wrapping Type, with 40 HP Motor. Machine Serial No. 201784.
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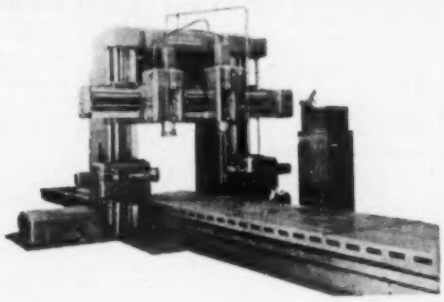

72"x72"x30' Ingersoll Adjustable Rail Planer Type Miller, with two rail heads and two side heads. Table feed range IPM ¾" to 36", Saddle feeds IPM ⅜" to 18", Length of bed ways 60'. Approximate weight 160,000 Lbs., Inspect at Albany.

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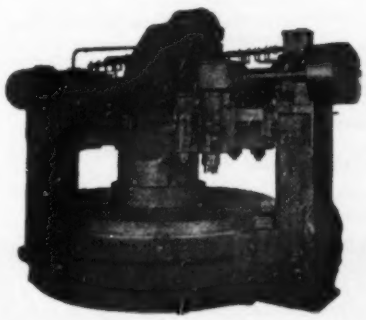

Equipped with 2 double heads, and 2 single heads, diameter spindle sleeves 6⅝" complete with 25 H.P. motor.

An ideal machine for continuous production of cylinder blocks, bases and a multitude of similar parts.

EMERMAN MACHINERY CORP.
875 W. 120th STREET **CHICAGO 43, ILL.**

LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1950 MODELS

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables.
CINCINNATI: #2M Vertical, Rotary table
CINCINNATI: 6-B Vertical
SUNDSTRAND: 96 Rigidmil—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #90 Rigidmil—Hydraulic
SUNDSTRAND: #9 Rigidmil
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" Table
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller

THREAD MILLERS & TAPPERS

HANSON-WHITNEY 8"x16" Thread Miller
MOREY: 12"x60" Thread Miller
LEES BRADNER: 40A Thread Miller
LEES BRADNER: LT 6x36" Thread Miller
HALL PLANETARY: B, C & D Thread Millers
MURCHEY: #22 Tapper, Horizontal
PRODUCTO: Hand Tapper
NATCO: Vertical Tapper 16 spindle

TOOL SHARPENERS

OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit Grinder Template Type
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-wheel grinder 5 HP

GRINDERS—THREAD

EXCELLO: #31 & #33 External
JONES & LAMSON: TG-636 External
JONES & LAMSON: TG848 External
JONES & LAMSON: TG1245 External

GRINDERS—CYLINDRICAL

NORTON: 6"x18" & 11"x18", Plain
NORTON: 10"x18" 45° angle wheel head
NORTON: 12"x36" Universal
LANDIS: 18"x18" "C" Plain Hydraulic
LANDIS: 16"x32" Type "D" Crankpin, Hydraulic
CINCINNATI: #2 Centerless
CINCINNATI: 6"x18" Hydraulic Filmatic
BROWN & SHARPE: #10 & #23 Plain

GRINDERS—INTERNAL

BRYANT: #5 and #5Y Internal
BRYANT: 10C16 Internal
HEALD: #55 Planetary

HEALD: 70A Plain Internal
HEALD: 72A3, 72A5 Plain & Universal
HEALD: 72A1 Sizematic Centerless
HEALD 72A3 Sizematic
HEALD 172 Sizematic for Cylindrical Cams
BRYANT: 112 Universal, Hydraulic
BRYANT: 16-28 Hole Grinder
BRYANT: 24-36 Heavy Duty Internal
RIVETT: #104 Tool Room Universal

GRINDERS—RADIUS

VAN NORMAN: #73, 630, 640 Oscillating
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE

THOMPSON: 6"x12"x10" Type B
THOMPSON: 12"x18"x96" Type C
HEALD: #22 Rotary—12" Chuck
ARTER: A-1-6" Rotary
GARDNER: 120A Opposed Head Disc

HONING & LAPPING

BARNES: 306 N Vertical
MICRONATIC: H-510 Double End Horizontal
MICRONATIC: H-2 Single End Horizontal
NORTON: #26C and 28F Hyprolaps
NORTON: #2Fx40" Diameter
SCHRANER: External Cylindrical

GEAR & SPLINE GRINDERS

PRATT & WHITNEY: 10" single & double wheel
GEAR GRIND MACH: GG-19 (10"x24"), Hydraulic Spur Gears & Splines also internal
GLEASON: #17 Beirel, Zerol & Hypoid Bevel
MAAG: S830 11¾" diameter

GEAR CUTTING MACHINES

BARBER-COLMAN: #3 Hobber
BROWN & SHARPE: #6 Cutter—72" diameter
CLEVELAND: #140 Hobber—1 spindle
FELLOWS: 6E2 Shaper
FELLOWS: 6H, 6H A, 64A, 7 & 72 Gear Shapers
FELLOWS: Straight Line Generator
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT: 12H Hobber, 18" dia.
GOULD & EBERHARDT: 360M Cutter
HAMILTON: #1 Hobber 6" diameter
SYKES: Gear Machinery (all sizes)

GEAR FINISHERS & TESTERS

FELLOWS: 8LSI & 13LSI Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #4 Fine Pitch Shaver 4" diameter
FELLOWS: #12-C Spacing Tester
GLEASON #13 Universal Gear Tester

GLEASON: #4 & #6 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: #224 Involute Checker and Recorder
RED RING: SIC-12" Gear Tester
ILLINOIS: No. 514 and 604 Gear Testers
FELLOWS: #8M Rod Liner

PRECISION BORING

BARNES: #412 Horizontal 60" Travel
HEALD: 48A Single End 2-spindle
HEALD: 47A Single End 2-spindle
HEALD: 46B Double End Borematic

LATHES—PRODUCTION

POTTER & JOHNSTON: #4D Automatic
SUNDSTRAND: 8x15 & 12x22 Stub Lathes
LODGE & SHIPLEY: #3A Duomatic
LIPE-ROLLWAY: 15"x10" Carbomatic
LEBLOND: 25"x48" Engine Lathe, raised to 40"

LATHES—TURRET

BULLARD: 24", 38" Vert. Spiral Drive
WEBSTER & BENNETT: Vertical Turret Lathes 36", 48" and 60" (all sizes)
GISHOLT: No. 4 and 5, Ram Type
HERBERT: Turret Lathes (all sizes)
JONES & LAMSON: 7A Saddle Type

DRILLING MACHINES

LELAND-GIFFORD #2LMS Deep Hole Vertical
BARNES: 20H½ 2 spindle on 4 spindle base
BAKER: 30HO 2 spindle inverted 4" cap.
BAKER: 21? Upright Heavy Duty
FOSDICK: #48M Upright High Speed
PROVIDENCE ENG: 6-spindle ⅝" capacity
PRATT & WHITNEY: ½Bx50 Deep Hole Reamer
ARCHDALE: Radial, all sizes (New)

SCREW MACHINES

ACME-GRIDLEY: RA6 9/16" 6-spindle

MISCELLANEOUS

CINCINNATI: 2-36 Broaching Machine
GLOUNT: Polishing Lathes 12x48
GARDNER: #6 Disc Grinder
ALLEN #2 Stud Setter
CAMPBELL: #425 Abrasive Cutalator
WILLIAMS: 10" Pipe Cut-Off
TANNEWITZ: GH-36 Band Saw High Speed
RANSOME: #36 Welding Positioner Motor Drive
KENT: 3½" Bar Pointer and Chamfer
MATTHEWS 79A Marking Machine
GENERAL: #33 Flexible Press
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27"-30½"x84" Monarch Geared Head Engine Lathe, T.A., M.D. (1942).

No. 14 Buffalo Steel Billet Shear. 5½" round capacity.

No. 10 Buffalo Steel Bar Cutter. 3½" round capacity.

No. 60 Cameron Rotary Cap Thread Roller, M.D.

12"x12" Type DA Dings Magnetic Chip Separator.

No. 40-5 Minster S.S.-D.B.G. Press. 16" stroke.

No. 4 LaPointe Broach, 50 ton capacity.

Aries Wire Stripper.

50 Ton Henry & Wright Dieing Machine.

10"x18" Cincinnati Model EA Grinder, serial #5P2A1L-13.

No. 5 Loshbough Jordan B.G.—O.B.I. Punch Press. M.D., 4½" stroke.

1½" Conomatic Automatic Screw Machines, late (3).

No. 2G Brown & Sharpe H.S. Aut. Screw Machine, 1941.

20" Ohio Shaper (1943).

No. 3¼ Bliss S.S. Toggle Press.

No. 6 Bliss S.S. Tie Rod Press.

No. 174 Toledo Tie Rod Toggle Press.

#660 Toledo 100 ton Knuckle Joint S.S. Press.

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GUARANTEED TOOLS

16"x60" PRATT & WHITNEY Toolroom Lathe

18"x96"C CINCINNATI Lathe, Taper, 1942

20"/40"x14' RAHN LARMON Geared Head Sliding Bed Gap Lathe

24"x24' LODGE & SHIPLEY Lathe, 18' centers.

No. 4A WARNER & SWASEY Turret Lathe, Full length leadscrew, tooling, New 1942

Model R-14 SENECA FALLS "Lo-Swing" Lathe, 16"x40", automatic timing, 1941

No. 2H KEARNEY & TRECKER Plain Mill, 1944

No. 2 CINCINNATI Dial Type Vertical Mill, power downfeed, rotary table, 1942

No. 3 CINCINNATI Dial Type Plain Mill, Vertical Head, 1941

No. 4 REED PRENTICE Vertical Mill and Die Sinker, rotary table, 1942

No. 1-18 CINCINNATI Plain Mill, 1942

No. 33 STOKERUNIT Production Mill, 1942

4" TAYLOR & FENN Duplex Spline Mill, 1942

No. 5BM FOSDICK 4 spindle Drill, power feeds, No. 3 M. T., 1942

4' FOOTE-BURT HAMMOND Jackknife Radial Drill with electric tapping attach., 1942

No. 3I LUCAS "Precision" Table Type Horizontal Boring Mill, 3" bor.

42" BULLARD New Era Type Vertical Turret Lathe, side head AC motor.

84" CONSOLIDATED COLBURN Vert. Boring Mill, 2 swivel heads, rapid traverse, AC-MD

6"x30" NORTON Type "C" Cylindrical Grinder, Hydraulic, 1940

No. 3 BROWN & SHARPE Universal Grinder, Internal Attach., 1941

O'CONNELL MACHINERY CO.

1825 NIAGARA ST BUFFALO 7, N.Y.

HOBBING MACHINE

#130 CLEVELAND RIGIDHOBBER 8" max. gear dia., 8" travel. Late Model—Excellent Cond.

ROSENKRANZ, WEISBECKER CO.

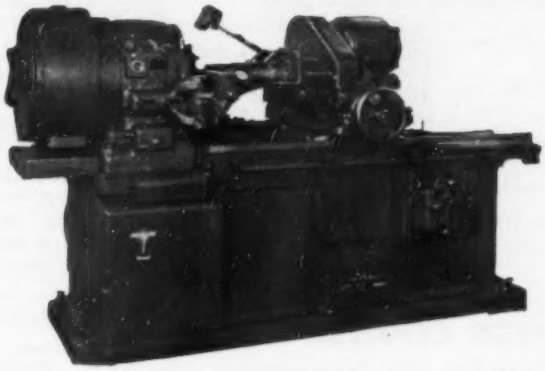
149 Broadway — New York 6, N. Y.

GRINDER—Blanchard #11 Rotary Surface
GRINDER—Cincinnati 12"x36" Universal
GRINDER—Heald 72A3 Internal Universal
THREAD GRINDER—J & L 6"x3" Internal
THREAD MILL—Hanson Whitney 8"x15"

BRM MACHINERY CORPORATION

57-8 Edison Place
Newark 2, New Jersey

BRAND NEW HEALD AIRPLANE CYLINDER GRINDERS



No. 73 Heald Airplane Cylinder Grinders, equipped with four A.C. motors and controls, Heald Red Head Spindle Type No. 147-6C with maximum speed of 5000 RPM, work-holding fixture with an assortment of flanges for various size cylinders. These machines were bought new in 1944 and are still in original crates. See cut.

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CHOICE MACHINES FOR QUICK SHIPMENT

BLOWER, Centr. I-R. type FS-347, CFM. 4400, MD. (new)
GEAR SHAPER, #7-72 Fellows, MD. New 1942.
GRINDER, Snagging, U.S. Elec. DE, 15 HP 3/60/220 V. motor.
GRINDER, Hyde. Surface, #25A. Heald, 16" Mag. Ck. New 1943.
GRINDER, Rot. Surface, Arter Model A-1-8, for wet grinding, MD. Ser. 1283.
GRINDERS, DE. US., 10 HP. motors 230 V. DC. (2)
MULTIMATICS, Bullard 8", with 6-spindles, MD. (3)
NIBBLER, #208 Savage, cap. ¼", tht. 8", turret hd. MD. Ser. 98781.
NIBBLER, #312 Savage, cap ⅜"; tht. 12", turret hd. MD. Ser. 1091.
PAINT SPRAY OUTFIT, Binks Pneu. Portable, Mod. E-1B., 5 Gal. cap. (New)
SAND MUELLER, #414 Clearfield, 4 Cuft. cap., MD. (1949)
SHAPER, 20" Cin. Hvy. Duty, sgl. screw, RPT., MD, Ser. 14022.
SHAPER, 36" Cin. Hvy. Duty, univ. table, swiv. vise, AC. MD., (1947)
TUMBLING MILL, Ransohff, 20 HP. AC. motor, complete equip't, #2770. (1944).

GALBREATH MACHINERY CO.
306 Empire Bldg. Pittsburgh 22, Pa.

MACHINERY SPECIALS

Pittsburgh 54"x30 ft. Geared Motor Driven Lathe with DC Variable Speed Motor, 27' between centers, has quick change gear, etc.

Lodge & Shipley 44"x21 ft. Geared Head Lathe, 11 Ft. 6" between centers, direct motor drive, large face plate fitted with chuck jaws.

Fay & Scott 24"x20' Extension Bed Gap Lathe, maximum swing in gap 54", 20' between centers, large face plate with chuck jaws, etc.

Fay & Scott 20"x8' Extension Bed Gap Lathe, maximum swing in gap 42", 8' between centers, arranged for motor drive, with standard equipment.

Niles 40"x14' Screw Cutting Lathe, standard change gear takes 6' between centers, belt driven.

Brown & Sharpe #2 Heavy duty Vertical Milling Machine, Late model with motor in base.

Cincinnati 45"x48" Hydromatic Milling Machine, with power rapid traverse fitted with 10 HP 220V AC motor, etc.

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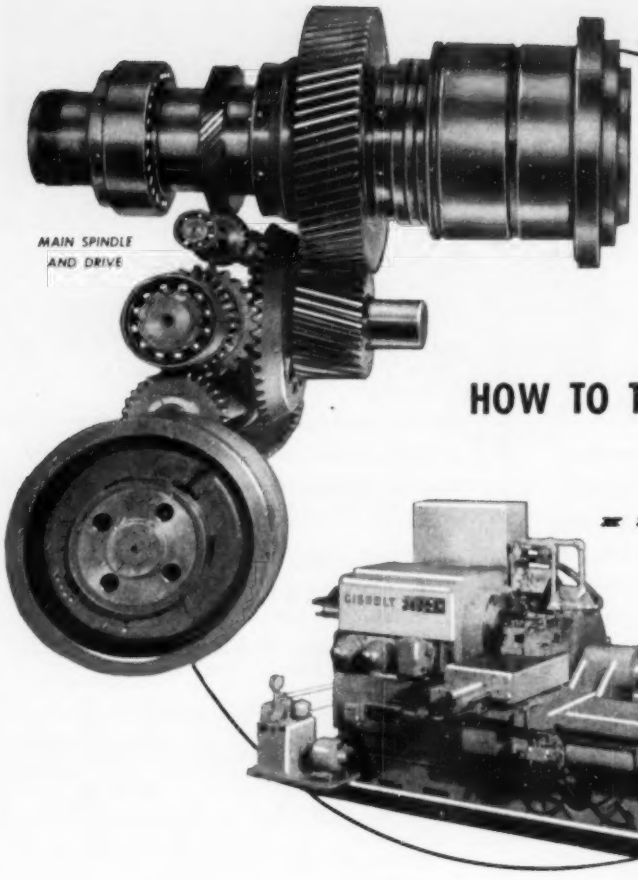

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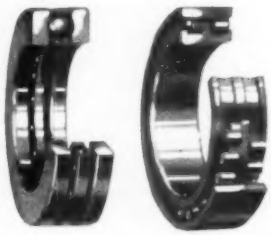

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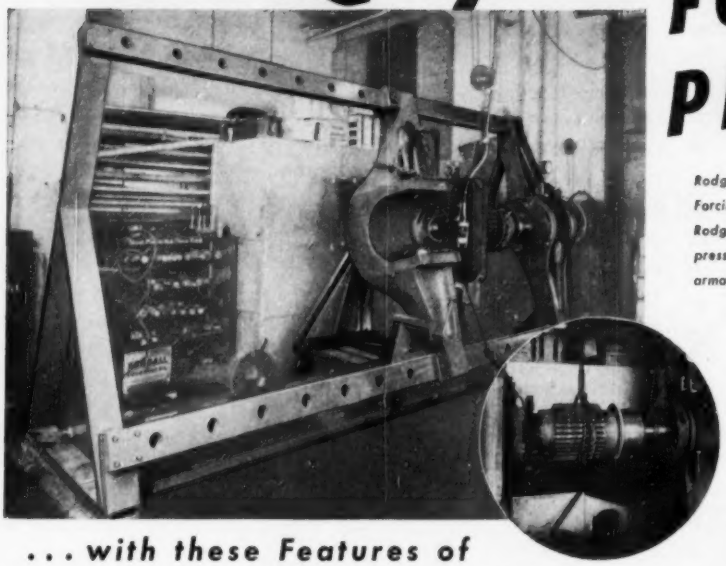
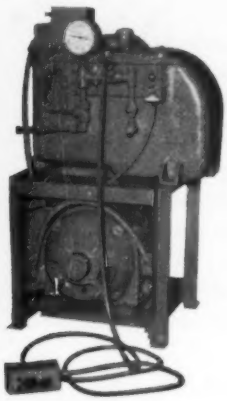
For Fast, Efficient Pressing Bending, Forming, Straightening...

New Rodgers FORCING PRESSES



Rodgers 300 Ton, 75° Inclined, Stationary Forcing Press, one of many in the complete Rodgers line. In the application shown, the press is being used efficiently to press an armature shaft.



. . . Separate Power Pump

Select your press operating unit from hand-driven pumps or power-driven pumps. Shown is a Rodgers 2-cylinder Power Pump with remote control.

. . . with these Features of Construction and Operation

- **SEPARATE PUMPING UNITS**—Choose from individual hand-operated or power-driven pumps to operate any model Rodgers Forcing Press.
- **REMOTE CONTROL OF POWER PUMPS**—Operator can control press from any desired position.
- **REMOVABLE HYDRAULIC CYLINDER**—Cylinder is easily removed from head member to permit servicing or use for other power applications.
- **INDIVIDUAL FRAME UNITS**—Tracks, tension bars, abutment member and head member are all separate units to facilitate handling and erection of press.
- **EXPERTLY ENGINEERED AND CONSTRUCTED**—All units of Rodgers Forcing Presses are made strong, durable and dependable to give years of reliable service.

. . . In these Types and Sizes

Rodgers Versatile Forcing Presses are available in portable or stationary models—horizontal, vertical, 75° or 90° inclined—100 to 600 tons—with hand-operated or power-driven pumps. In this broad selection, you'll find the ideal press to meet your requirements.

Send for New Catalog...

For full details and specifications on the complete line of Rodgers Forcing Presses send for Catalog 315.

HYDRAULICS Rodgers RULE THE WORLD MOVES

Rodgers Hydraulic, Inc.

7407 WALKER ST., ST. LOUIS PARK, MINNEAPOLIS 16, MINN.

HYDRAULIC POWER EQUIPMENT

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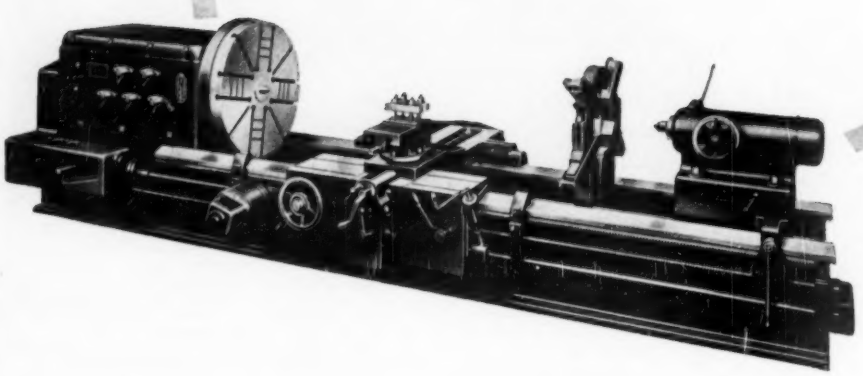
Announcing

the

NEW NILES

Heavy-Duty Engine Lathe



Here's a new line of Niles heavy-duty engine lathes -- improved in many important respects over the older famous Niles lathes. There are more antifriction bearings. Beds are heavier. Automatic lubrication is more extensive. All 56 feeds and threads are instantly available without changing quadrant gearing.

Range of sizes is from 40" to 80", and up.

All models have the extra margin of power, strength and rigidity which have made Niles machine tools so well known for maintained accuracy under heavy-duty operating conditions.

* *

Full information on these new lathes can be obtained through Lima-Hamilton offices in New York, Chicago and other principal cities or by writing directly to Lima-Hamilton Corp., N. 3rd Street, Hamilton, Ohio.

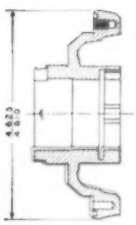
LIMA HAMILTON CORPORATION

NILES TOOL WORKS CO. **HAMILTON, OHIO**

A division of the Lima-Hamilton Corporation

CUT-RATE, sub-standard marginal producers can expect distinguished company — namely the long established reputable manufacturer caught in the squeeze between competitive pricing and high costs. The margins are moving in — but there's room at the center of today's business picture for the manufacturer who takes advantage of the *new* standards of machine tool performance.

NEW BRITAIN
MODEL 675 AUTOMATIC CHUCKING MACHINE



Automotive transmission part, AISI C-1050 drop forged steel, finished in two operations on two New Britain Model 675 Carbide Tooled Chucking Machines. Sixty-five pieces are completed per hour with thirty-five operations performed by the two machines. They include forming, drilling, boring, turning, facing, grooving, trepanning, radius forming, chamfering, recessing and finish reaming. Unusual accuracy is required in maintaining one-thousandth tolerance on the diameters of the two bores and two-thousandths total indicator reading limits of concentricity. Typical of the ability of fully modern New Britains to make profits by making production fast, accurate and automatic.

NEW BRITAIN
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

MULTIPLE SPINDLE AUTOMATIC SCREW AND CHUCKING MACHINES • SINGLE AND DOUBLE END PRECISION STRAIGHT AND CONTOUR BORING MACHINES • LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINES

How TIMKEN® bearings help ram-type lathe turn 3/4-ton part

ALTHOUGH this Gisholt No. 5 ram-type lathe normally handles 2½" bar work, it's being used here to machine locomotive axles weighing ¾ of a ton! One reason for this Gisholt lathe's extra capacity: Timken® bearings on the spindle and in the headstock.

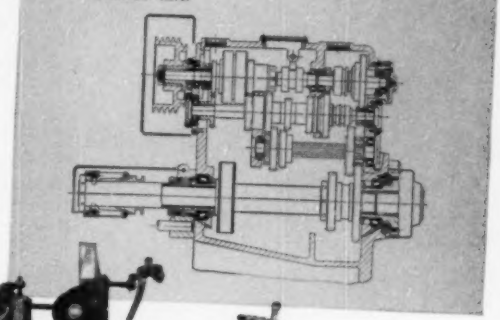
Mounted on Timken tapered roller bearings, Gisholt spindles stay rigid and free of vibration under the heaviest loads. Line contact between the rollers and races of Timken bearings give the spindle maximum support. Deflection or end-movement is minimized. The tapered construction of Timken bearings enables them to carry tremendous thrust as well as radial loads. And it permits pre-loading to any desired degree.

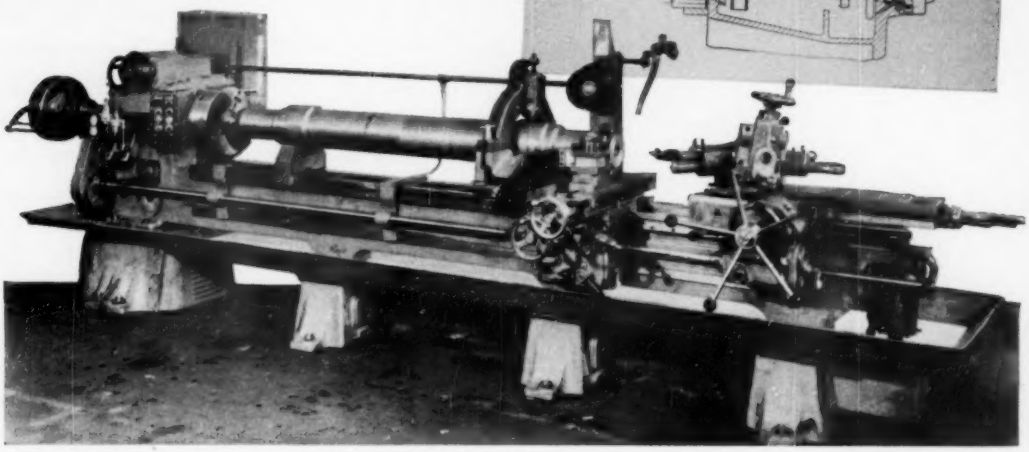
Timken bearings are made of the best steel ever developed for tapered roller bearings—Timken fine alloy steel. The rollers and races are case-hardened for exceptional resistance to wear, and have tough, shock-resisting inner cores. Incredibly smooth surface finish and true rolling motion virtually eliminate friction. And Timken bearings enable spindles and shafts to retain their original accuracy for long years of service.

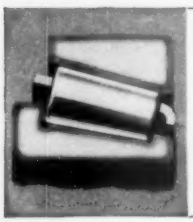
Backed by 50 years of bearing research and development, Timken tapered roller bearings are the No. 1 choice throughout industry. Whether you build or buy, be certain every machine is equipped with Timken bearings. Look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

THE GISHOLT MACHINE COMPANY *uses Timken bearings on the spindle and throughout the headstock of their ram-type and other lathes, insuring smooth, accurate, vibration-free performance under the heaviest cuts.*







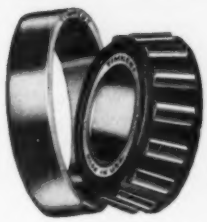
GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer. The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ▯→ LOADS OR ANY COMBINATION ✳